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NATURAL HISTORY

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ALASKA'S BOUNTY ON THE AMERICAN EAGLE
BY WILLIAM T. HORNADAY

YOSEMITE AND JOHN MUIR
BY WILLIAM FREDERIC BADÈ

FREE NATURE EDUCATION
BY GEORGE H. SHERWOOD

"MANHATTAN MEDICAL SCHOOL"—DELIGHTS OF THE NATURE PHOTOGRAPHER—ROCK RIVERS—THE ZOÖLOGIST IN JAMAICA—SCHOOLBOY'S FOREST—HISTORIC TREES—INDIAN MUSIC—ACTIVITIES OF THE BLIND—HENRY S. GRAVES—BURROUGHS—ABBOTT'S "ROOSEVELT"

JOURNAL OF THE AMERICAN MUSEUM OF NATURAL HISTORY

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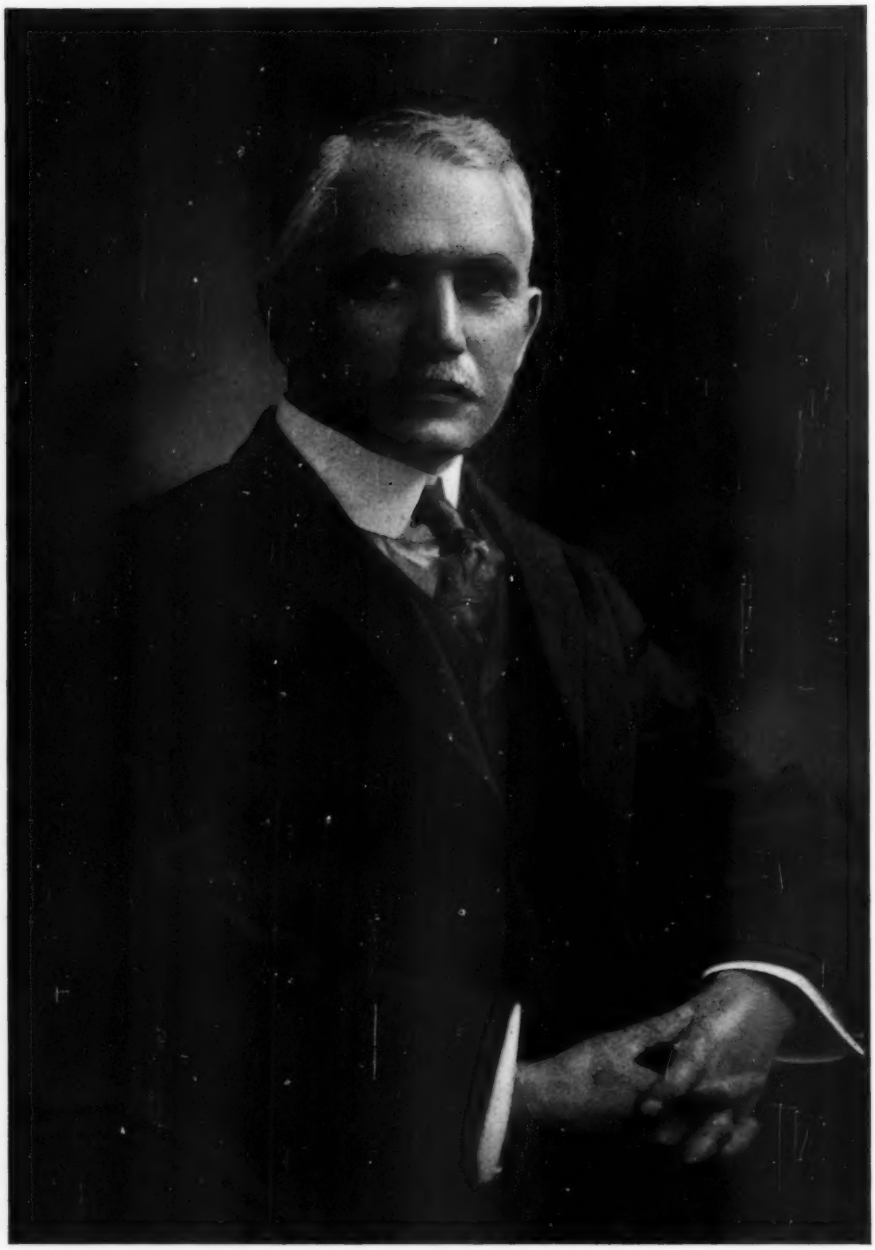

GEORGE H. SHERWOOD

Curator of Public Education in the American Museum

Mr. Sherwood is a graduate of Brown University and came to the American Museum in November, 1901, as assistant curator of invertebrate zoölogy. In 1906 he was appointed curator of the department of public instruction (now officially designated "public education"), following the retirement of Professor Albert S. Bickmore. Mr. Sherwood at this time also assumed administrative duties as assistant treasurer (1906–10) and assistant secretary of the Museum (1906–) to which the greater part of his time is given. Under his direction, the present close relations with the public schools have been developed. The Museum has just published a history of its educational work, prepared by Mr. Sherwood, entitled *Free Nature Education*.

See "New Plans in Nature Extension Work," p. 173

NATURAL HISTORY

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Alaska Can Save the American Eagle

THE BIRD OF OUR NATIONAL HISTORY THREATENED WITH EXTINCTION

By WILLIAM T. HORNADAY

Director, New York Zoölogical Park since 1896, and an initial power in the promotion of preserves and laws for the conservation of wild life in America

THE American "Bird of Freedom," inseparably associated with the Stars and Stripes since the beginning of the American Republic, today is under attack, and its race will succumb to extermination unless relief arrives at once. And there can be only one adequate relief. The legislative body of Alaska must repeal its bounty law—for to put a price on the heads of the members of a species of wild life, as has been done on the bald eagle throughout Alaskan territory, is the one surest way to exterminate that species.

The soldier graves in France record the toll of the many Americans who lost their lives as they fought under the American flag and followed the lead of the American eagle in the great World War. Here in America for the period of the war millions of school children the country over have daily saluted the American flag. Have they been taught about the American Eagle? Perhaps in our devotion to the "Stars and Stripes," we have somewhat forgotten "Old Baldy," which our forefathers chose more than a century ago as the standard bearer of the nation, and which is immortalized in our literature and on our coinage. Its wild bold ranging of cliff and sky typified the liberty the American colonists sought and they adopted the great bird as the emblem of American freedom—yet through the act of Americans the living race of the eagle is today traveling the quick road to oblivion!

Two years ago the territorial government of Alaska was misled by stories of alleged "destruction of salmon and game" perpetrated by eagles, to enact a blanket law and offer a bounty of fifty cents a head for eagles, either the golden or white-headed species, throughout the territory. This was in opposition to the practice of the United States Department of Agriculture during the last twenty-five years. The policy is against paying bounties even on hawks, and this policy is based on the research and experience of more than half a century.

The bald eagle, however, is particularly a harmless bird in most localities. Living along river margins and the seacoast, it has small opportunity to feed upon the game animals of more wooded areas. Its favorite food is fish and in Alaska it feeds on the salmon which die on their spawning beds after spawning. As all salmon die in this way surely a share of them may be granted as the eagle's lawful prey.

Now it is entirely conceivable that in small areas here and there in America, eagles, or bear, and even such gentle creatures as bobolinks, doves, and rob-

THE AMERICAN EAGLE

The bald eagle (*Haliæetus leucocephalus*) is threatened with extinction in its last retreat, the Territory of Alaska. This highly conspicuous bird has always been handicapped in the struggle to maintain itself against the encroachments of man, despite its great strength, unequaled power of flight, and longevity. In Alaska the species has encountered such great hostility that a price is now on its head and unless the territorial legislature, or Congress, can be prevailed upon to afford protection, its days are numbered. The present situation is entirely the result of misinformation and prejudice, for the eagle feeds largely upon dead fish, especially seaward-bound salmon which after spawning die before they reach open water. Surely, if the public is adequately informed, it will not permit one state or territory to nullify the efforts of all the others to preserve from extinction one of the most picturesque representatives of our wild life and the emblem of the American nation. This illustration is from the Brooklyn Museum's bald-eagle group, destroyed by fire in 1914. The specimens were collected in Virginia by Mr. R. H. Rockwell

With appreciation of the courtesy of the Brooklyn Museum in allowing reproduction of this photograph of what was one of its most remarkable groups

ins,—even female deer, may become so numerous as to constitute nuisances, requiring abatement by systematic and carefully considered measures. For such cases New York, for instance, has an admirable wild-animal nuisance law —rarely invoked, however. The necessity to kill off a wild surplus in a given locality has long been conceded; but to sweep a whole province on an exterminatory basis—by a price on heads, open to every gunner—is quite a different matter.

We will admit that the mistake of granting a bounty on the eagle in Alaska was typical of our government which tries to be "all things to all men" and in so doing often burdens or bereaves the whole continent in order to facilitate the success of an insistent few in a limited locality—whether they be lumbermen, fishermen, or fur farmers. Locally in Alaska there has been reaction against the bounty on eagles and the law will eventually be repealed. In the last session of the territorial legislature, Senator D. A. Sutherland led a movement designed to do away with it, but was defeated. May Alaska waken so that the repeal will not come too late. When we know the very small total number of living eagles at best, the tale of 5060 slaughtered and paid for up to January 1, 1920, is to American ornithologists and wild life protectors, as well as to patriotic citizens of the country, distinctly disconcerting.

The Alaskan white-headed eagle is the largest and finest on the continent and everywhere outside of Alaska the species is steadily becoming very scarce. In the Eastern States only a few remain in place of the many that were here even thirty years ago. Not enough mature birds are caught to keep the zoos supplied. The eagle is a slow breeder, and the population of the species is continually diminishing. Once the Palisades of the Hudson knew the great bird well, but ere long the slow and majestic sweep of its broad pinions will be looked for there in vain.

Civilization is against the eagle. It is robbing it of its lawful prey, and giving it nothing in return. Far too much has this bird of our national history been flouted and neglected. We must honor it more, protect it better, or see it wholly disappear from the land of our fathers.

The bald eagle and heraldic symbols of the Great Seal of the United States after the new cutting made by the direction of President Roosevelt in 1903.—The original design was drawn by Will Barton, A. M., and adopted in 1782. "The escutcheon," explained Barton, "is borne on the breast of the American eagle, without any other support, to denote that the United States of America ought to rely on their own virtues"

The Schoolboy and His Forest[1]

By FRANK H. WOOD

The University of the State of New York, Albany, New York

THESE are two very suggestive and illuminating words—schoolboy and forest, which unloose the doors of our memory and our imagination. To what extent of time, place, and circumstance do they not take us! As we meditate on each in its bearing upon our own personal experience, how readily the past becomes present! How vivid seem the pictures that have been long hidden away in the inner recesses of the mind!

In considering the first cardinal word of our subject, in these days of "equal rights and equal opportunities"—and let us not forget to add, also, multiplied responsibilities—we must turn entirely aside from the lexicographer, and think of the boy as a human being, an animal of the genus *Homo,* between the ages of five and twenty-one.

This is the entire period that bridges over that critical time between childhood and maturity, that begins in weakness, immaturity, and dependence, and ends in strength, vigor, and self-reliance. It is the habit-forming period, the period of easy and lasting impression, the time when the seeds of good or ill may be most readily implanted and will take deepest root. It is the time when the senses are most alert, when the feelings are most easily aroused and the sensibilities are most readily appealed to, when the intellect is most susceptible of development and the will of training. It is the time when the imagination is most active, can be most readily aroused and easily cultivated. It is a time indeed to see visions and to dream dreams:

> "There was a time when meadow, grove, and stream,
> The earth, and every common sight,
> To me did seem
> Apparelled in celestial light,
> The glory and the freshness of a dream."

The use that is made of this period will inevitably exert a wide influence on the industries and occupations of life, on the trades and the professions. It will affect the character of the home, the appearance of the landscape; it will enter largely into the lives of the people, into the nature of their dealings, the character of their relations; yes, far more, upon it will ultimately depend the destiny of the nation.

If we turn to the encyclopedia or the dictionary for the meaning of forest, the second key word of our subject, we find it explained in about these words: "a tract of land or of country covered with trees"; and then, if we look farther, we find that a tree is "a woody plant of considerable size with a single trunk." There is indeed very little to satisfy us in such definitions.

If we should turn to the woodman or to the manufacturer or dealer in forest products, he would define the word in terms of feet of lumber, tons of pulp, or dollars of profit. The naturalist would think of the forest as a shelter or home for the birds and wild beasts; the artist as that which gives form, color, and setting to the landscape, and satisfies ideals of the beautiful and the picturesque; and the lover of nature would regard it as a sacred retreat, a shrine for rest, quiet, and communion.

[1] Extracts from address presented by Dr. Wood on April 12, 1920, at the First Annual Forest Week meetings of the New York State College of Forestry, Syracuse University.

The forest should convey to the mind and heart all of these ideas and meanings—and more. Before attempting to understand what the forest means, one must know it from actual contact and personal knowledge; one must also see it through the eyes of others, past and present; one should draw upon all sources that I have already mentioned, and also upon the wealth of history and the teachings of tradition, poetry, and song.

Away back in early sacred history, in the Levitical law, we find Moses, the lawgiver, forbidding the destruction of trees in laying siege to cities, "Thou shalt not destroy the trees, for the tree of the field is man's life." In his majestic "Forest Hymn," Bryant says:

"The groves were God's first temples, ere man learned
To hew the shaft and lay the architrave,
And spread the roof above them, ere he framed
The lofty vault, to gather and roll back
The sound of anthems; in the darkling wood,
Amidst the cool and silence, he knelt down,
And offered to the Mightiest solemn thanks
And supplication."

And notwithstanding the very considerable modern neglect and desecration of forests, we still may know that all through the ages, reaching down even to the present moment, trees and forests have been sacred to worship.

Some four hundred years ago, Edmund Waller in his beautiful poem "On St. James's Park" sang thus:

"In such green palaces the first kings reign'd,
Slept in their shades, and Angels entertain'd;
With such old counsellors they did advise,
And, by frequenting sacred groves, grew wise."

The forest is a unique place for rest and recreation. How many wearied with the tasks of life, with the cares and strifes of daily action are wont to look to the forest for refreshment—as Edwin Markham writes:

"Give me green rafters and the quiet hills
Where peace will mix a philter for my ills—
Rafters of cedar and of sycamore,
Where I can stretch out on the sacred floor,
And see them peer—the softly stepping shapes—
By the still pool where hang the tart wild grapes.

There on the hills of summer let me lie
On the cool grass in friendship with the sky.
Let me lie there in love with earth and sun,
And wonder up at the light-foot winds that run,
Stirring the delicate edges of the trees,
And shaking down a music of the seas."

Edward Roland Sill in "Forest Home" very tenderly puts into verse this longing for the forest rest, at once so human and yet so exalted.

"Oh, Forest-Mother, I have stayed,
Too long away from thee;
Let me come home for these few hours
That from the world are free."

'Twere sweet, I know, to stay; but so
'Twere sweetest to depart,
Thy cool, still hand upon my face,
Thy silence in my heart."

To one of experience and imagination, with acquaintance with the forest, these references and quotations bring out something of the meaning of the word, but to define or describe it, to convey its real meaning in words would be a hopeless and impossible task. The man who knows the meaning of the word is in touch with the forest in its various and varying moods, he feels them, he senses them by day and by night, in summer and in winter, in sunshine and in storm. He comes to know forest values also—healthful and re-

creational, æsthetic and spiritual, as well as commercial and utilitarian.

The schoolboy's forest then must be the forest in which all of these ideals have been implanted and inculcated. They must be felt in their essence and not defined and formalized by words.

To the youth as to the people of antiquity, the forest is the natural realm of legends, folk lore, myths, and fables. It is peopled with sprites and fairies, tree gods, and divinities; it is the realm of the supernatural, in which is found condensed in figurative and mythical language much of the riches of race experience and the spiritual wealth of past ages.

In one of his lectures on "Race Power in Literature," delivered before the Lowell Institute in Boston in 1903, Dr. George Edward Woodberry calls mythology one of the "three tongues of the imagination," the other two being chivalry and the Scriptures; and then he pictures their importance in this strongly significant language:

"It is far more important to know them than to learn French or German, or Latin or Italian, or Greek; they are three branches of that universal language which, though vainly sought on the lips of men, is found in their minds and hearts. To omit these in education is to deprive youth of its inheritance. It is like destroying a long developed organ of the body, like putting out the eye or silencing the nerves of hearing. Nor is it enough to look them up in encyclopedias and notes and so obtain a piecemeal information; one must grow familiar with these forms of beauty, forms of honor, forms of richness, have something of the same sense of their reality as that felt by Homer and Virgil, by the singer of 'Roland' and the chronicler of 'Mort d'Arthur,' by St. Augustine, and St. Thomas."

Thus it is that the schoolboy's forest must first of all be a forest of myths and legends; and the riches of the past must be freely drawn upon to provide an abundance of the best which has been handed down from father to son, from generation to generation, and age to age, through all the centuries of the past.

After the age of myths and legends and in part contemporary with it, there follows another period in the boy's life, the spirit of which is depicted in the opening lines of the old familiar song:

"Oh the sports of childhood!
Roaming through the wildwood"

and in the words of Wordsworth,

"And then my heart with pleasure fills,
And dances with the daffodils."

It is the period of growth and development when the forest becomes the natural recreation field for youth, nature's playground, the most fitting place for walks, tramps, sports, and games, the place to hunt wild flowers, to search acquaintance with insects and animals, and to become familiar with all forms and kinds of plant life.

Then it is that the schoolboy should come into intimate association and direct communion with the trees and forests in their manifold forms, shapes, and expressions. This is the time of all times for him to acquire tree knowledge and forest lore by observation and objective study.

It is the duty and privilege of the school to make the most of all favorable opportunities to further and encourage this sort of training in tactful ways, by appropriate means, at opportune times, and to direct and supervise it, bearing in mind that that which appears accidental and incidental in instruction often proves the most serviceable, beneficial, and enduring.

Unfortunate is it indeed when, through man's negligence, ignorance, wastefulness, and greed in regard to the nation's forests, the boy is deprived of free association with them; and also

unfortunate is the boy who, as Cowper says,

"Immured in cities, still retains
His inborn, indistinguishable thirst,
Of rural scenes, compensating his loss
By supplemental shifts, the best he may.
The most unfurnished with the means of life
And they that never pass their brick-wall bounds
To range the fields, and treat their lungs with air,
Yet feel the burning instinct."

Later on in the life of a youth there comes a stage of progress and development when instruction may assume a formal character, when books and periodicals may be drawn upon more freely, when the teacher and the boy can come into sympathetic understanding without the living medium of the trees to make the lessons interesting and helpful.

Then is a time to give the schoolboy formal lessons in plant life and plant growth, to give instruction in the care of trees, their uses, the commercial products that come from them, the need of forest protection, and in simplified form the aims and some of the principles of forestry.

This is a stage when can be used effectively such an incident as narrated by Sir Walter Scott in his tale of a Highland laird, who while on his deathbed said to his son, "Jock, when ye hae naething else to do, ye may be aye sticking in a tree; it will be growing, Jock, when ye're sleeping." Pupils should be taught about noted forests and forest preserves, past and present, should learn names, location, and incidents connected with famous individual trees in history, especially of our own country, such as the Charter Oak and the Hartford Elm.

There comes a time also when it is fitting to consider in somewhat formal manner trees and woods from the æsthetic standpoint, to study and search out the elements of beauty in them, to learn to appreciate their shapeliness, to make a study of the individual tree as well as the tree mass, to select the finest illustrations of beautiful trees to be found in the neighborhood, to learn to distinguish at sight trees of different kinds by their special characteristics.

The schoolboy needs all of the help and encouragement from outside sources that he can receive in order to make his forest what it ought to be.

And what is the Schoolboy's Forest? It is the forest that is implanted during the boy's school days when the conditions are so favorable, when the soil is responsive to culture—the forest that grows with his growth and develops with his development. It is the forest that can be visualized only in his manhood. It is to be seen then in his home, along the roadsides and in the public parks of his home city, and in the forest preserves of his home state. In a word, the Schoolboy's Forest is one the seeds of which are sown in the mind and heart of the boy and blossom into full fruitage in the life of the man.

John Muir in Yosemite

By WILLIAM FREDERIC BADÈ[1]

IMAGINE the Rip Van Winkle bewilderment of an old Yosemite pioneer like James C. Lamon, if he could wake from his forty-five years' sleep in the little graveyard near the mouth of Indian Cañon, and come back to his old haunts! During the sixties and seventies the sunny quiet of the valley was hardly broken by the deep monotone of the waterfalls whose music, even for a newcomer, seemed part of the great, sheer-walled silence. But now, at the height of the tourist season, great camps and hotels, crowded with thousands of visitors, shed unwonted noise and electric glare among the astonished groves and their furred and feathered inhabitants. Old-time trails, grown into highways, resound with the horns of innumerable automobiles, and a railroad delivers its human freight of recreation seekers at a terminal on the edge of the park, twelve miles from the valley.

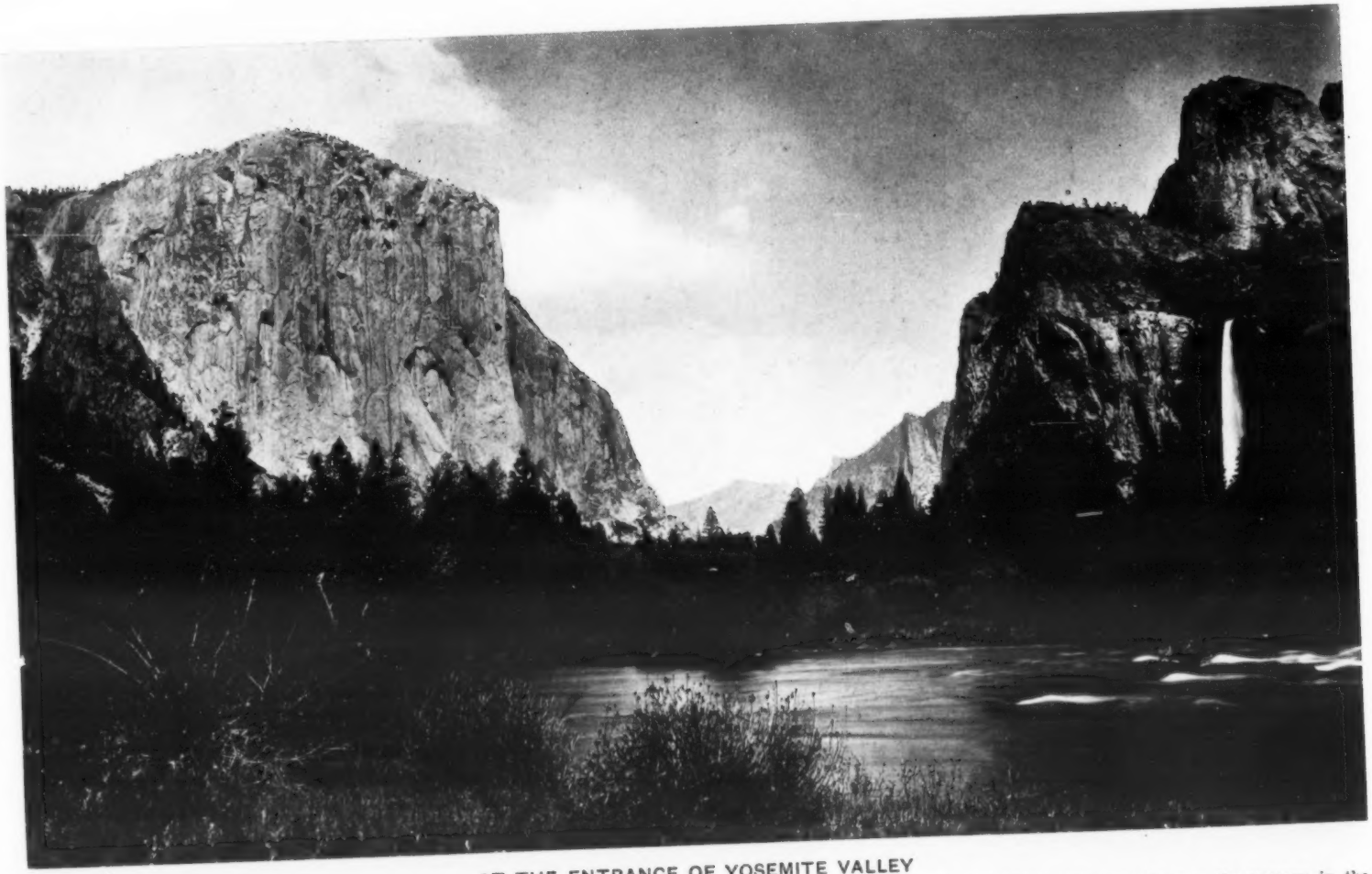
From the end of the sixties until well into the seventies John Muir also made his home in Yosemite, but he lived far enough beyond these decades to see the rising human tide of pleasure seekers set Yosemite-ward, and rejoiced in the sight. He used to say that he was moved to write about the beauty and sublimity of the valley only because he wished to incite people to come and see it for themselves. And now that they are coming in ever-increasing numbers they in turn are beginning to ask questions about the man who described it so alluringly. Where, in the valley, did he live? What was his occupation while there, and how did he go about his studies?

Although in the adventurous life of John Muir fact often was more wonderful than fiction, inquirers are sometimes obliged to content themselves with the latter. Perhaps it is natural that so picturesque a personality should become a magnet for legends. In any case, although he has been gone only five years, one legend is already current in Yosemite Valley. It concerns the place of his former habitation. There is little doubt that it owes its origin to the desire of local cicerones to gratify the desire of visitors who wish to see some particular spot that has associations with John Muir.

In a secluded, umbrageous tangle of alders and azaleas, on the spit of land formed by the confluence of Tenaya Creek with the Merced, stands what at first glance looks like the remnants of a log cabin. Examination reveals the fact that there never had been a floor or windows; that it was never more than partly roofed and too low for a man to stand comfortably erect, while the opening which should serve as a door is only three feet high. It is all that remains of Lamon's goat or sheep corral. But the myth-making faculty of the local guide and antiquary has glorified it as "Muir's Lost Cabin," and as such it has been and is being pointed out to great numbers of eager sightseers. The adjective "lost" is an important adjunct; it stimulates curiosity by hinting at mystery.

But there is no mystery about the two cabins which John Muir erected for himself in Yosemite. The places where they stood are known, although not a vestige of the original structures remains. The first he erected late in 1869 near the lower Yosemite Falls.

[1] Professor Badè has recently been made president of the Sierra Club. He is editor of the *Sierra Club Bulletin*, and professor of Old Testament literature and Semitic languages at the Pacific School of Religion, Berkeley, California, and is well known for his work as a conservationist. He is president of the California Associated Societies for the Conservation of Wild Life.



AT THE ENTRANCE OF YOSEMITE VALLEY

"To an observer . . . . in the midst of such scenery, ... the day seems endless, the sun stands still. Much faithless fuss is made over the passage in the Bible telling of the standing still of the sun for Joshua. Here you may learn that the miracle occurs for every devout mountaineer, for everybody doing anything worth doing, seeing anything worth seeing. One day is as a thousand years, a thousand years as one day, and while yet in the flesh we enjoy immortality."—From John Muir's *Our National Parks*, 1901 (p. 102).

Muir expressed the same idea in one of his last conversations with Professor Badè, and the latter quotes it in his "Introduction" to Muir's *Story of My Boyhood and Youth:* "Longest is the life that contains the largest amount of time-effacing enjoyment—of work that is a steady delight. Such a life may really comprise an eternity upon earth"

Courtesy of Brown Brothers

It was from such points of vantage that Muir studied Yosemite. Especially was it his delight to reach some high ridge during or immediately after a heavy winter storm, in order to see the sunset over a wide extent of snow-covered mountain and forest, to study the wind-blown snow clouds as they swirled from peak to peak, and snow avalanches as they swept down the cañons. Just once was he forced to ride on such an avalanche. He had spent the whole day, waist deep in snow, climbing laboriously up the cañon. He had hoped to reach the ridge 3000 feet above before sunset, but when still a few hundred feet of his goal, he was suddenly swished, in the space of about a minute, down to the bottom of the cañon —fortunately on top instead of buried under the snow. He always spoke of the experience as the most "spiritual" of all his travels, a "flight in a milky way of snow flowers" (*Our National Parks*, p. 276)

The only photograph ever taken, so far as known, of John Muir's cabin, his first home in Yosemite.—Unfortunately the picture shows the roof only, the walls being hidden by tall ferns and second growths. The cabin was built of sugar-pine "shakes," and through one corner flowed and sang a stream of rapid water diverted from Yosemite Creek. Nothing remains of Muir's cabin today, or of his "hang-nest," a retreat near his cabin, built high and reached by a ladder. Emerson visited this "hang-nest" and looked with Muir through its two skylights,—one giving a view of South Dome, the opposite, of upper Yosemite Falls. (*Photograph by the late George Fiske*)

To Muir, South Dome, or Half Dome as it is also called (at the right), which rises from woods and meadows to a height of 4750 feet above the valley, had no sense of the dead stone about it; instead, it gave him an impression of steadfastness in serene strength—like a god

The quiet waters of Mirror Lake.—This and the many other beauties of Yosemite, known to so few in the early days of John Muir, are now seen and enjoyed by thousands of American tourists yearly. There is something worth while to be discovered in Yosemite all the year round

This cabin was built of sugar-pine shakes and is reputed to have been the handsomest building in the valley. By means of a ditch he made a part of the beaten waters of Yosemite Creek flow through a corner of the cabin, with just enough current to make it "sing and warble in low sweet tones" as it bickered by his bed.

He was employed at this time by J. M. Hutchings to construct a sawmill —not, however, for the cutting of living trees. A few years earlier a severe windstorm, sweeping through the valley, had thrown down a large number of cedars and pines. These, by express permission of the commissioners, Mr. Hutchings was allowed to convert into building material. It seems important to state these facts since during the Hetch-Hetchy controversy some of Muir's opponents falsely charged that he had erected a sawmill in Yosemite Valley in order to denude it of its trees. The very site of the old sawmill is still surrounded by pines and incense cedars of great age.

At one end of the mill he had built for himself a unique retreat, attached to the gable, which people called "the hang-nest." A kind of chicken-ladder led up to this sky parlor, and in writing to his sister he humorously remarked, "Fortunately the only people I dislike are afraid to enter it." Ralph Waldo Emerson climbed into it to look over his sketches and botanical collection and came away declaring fervently, "Muir is more wonderful than Thoreau." We may imagine with what enthusiasm Muir showed Emerson the sights to be seen from his two skylights on opposite sides of the roof. One opening commanded a view of South Dome, and the corresponding one on the other side made a frame for a living picture of the upper Yosemite Falls. "Here," we might have heard him say, "nature offers brimming cups in endless variety, served in a grand hall, the sky its ceiling, the mountains its walls, decorated with glorious paintings and enlivened with bands of music ever playing."

This hang-nest and his sugar-pine cabin were the places which he called his first home in Yosemite. There, as the letter of a reminiscent friend reveals, he might be found under the lamp in the evening reading the writings of Alexander von Humboldt and Sir Charles Lyell, and the latest botanical works on trees. Through his numerous friends the most important new books of a literary or scientific nature speedily found their way to his cabin where the long winter evenings, especially, were devoted to a wide range of reading and research.

In the summer of 1871 he left the employ of J. M. Hutchings, and in December he wrote from his old haunts along the Tuolumne near Lagrange that Mr. Hutchings required the sugar-pine cabin for his sister, and that in consequence he was "homeless again." "I expected to pass the winter there writing, sketching, etc., and in making exploratory raids back over the mountains in the snow. But Mr. Hutchings' 'jumping' my nest, after expressly promising to keep it for me, has broken my pleasant lot of plans, and I am at work making new ones."

In January, 1872, he was back in the valley, "gloriously snow-bound." He had taken up his quarters at Black's Hotel which stood not far from the massive pedestal of Sentinel Rock. It was during the winter season of this year that two natural phenomena occurred which deeply impressed Mr. Muir. The one was a great flood-storm, the other a violent earthquake. Of the former he wrote to his sister Sarah, "We have had the grandest flood that has occurred in three years. More than three hundred falls, averaging near three thousand feet in height, sang together in glorious jubilee, besides a countless company of silvery arteries gleaming everywhere. A per-

Courtesy of the Sierra Club Bulletin

THE MERCED, OR "RIVER OF MERCY," THROUGH THE VALLEY

The Merced flows through Yosemite (4000 feet elevation), and the walls of the valley at right and left rise 5000, and 6000, and 7000 feet in living rock sculptures. Here have stood for many thousands of years the majestic cliffs, domes, and spires, unaltered under the attacks of avalanche and storm. Muir gloried in the rain storms of the high Sierras, which he described as extravagant in their grandeur: the thunder speaks with concentrated energy as though an entire mountain were being shattered at every stroke; the ground of mountain-side and valley everywhere becomes covered with a transparent sheet of flowing water, and water booms and shouts down the ravines. And who but Muir would have said, "Happy the showers that fall on so fair a wilderness as Yosemite"

Yosemite trees under the snows of winter time

fect storm of waterfalls, the smallest with a voice that was hearable at a distance of several miles." The same letter contains a hint of his literary activity at this time,—"With this mail," he writes, "I send thirty letters, and the writing of these, together with my glacial studies, has kept me busy."

The earthquake occurred March 26, 1872. "At half-past two o'clock of a moonlit morning," Muir wrote, "I was awakened by a tremendous earthquake, and though I had never before enjoyed a storm of this sort, the thrilling motion could not be mistaken, and I ran out of my cabin, both glad and frightened, shouting, 'A noble earthquake! A noble earthquake!' feeling sure I was going to learn something. The shocks were so violent and varied, and succeeded one another so closely, that I had to balance myself carefully in walking as if on the deck of a ship among waves, and it seemed impossible that the high cliffs of the valley could escape being shattered. In particular, I feared that the sheer-fronted Sentinel Rock, towering above my cabin, would be shaken down, and I took shelter back of a large yellow pine hoping that it might protect me from at least the smaller outbounding bowlders. For a minute or two the shocks became more and more violent—flashing horizontal thrusts mixed with a few twists and battering, explosive, upheaving jolts,—as if nature were wrecking her Yosemite temple, and getting ready to build a better one." It was on this occasion that he saw Eagle Rock on the south wall give way and fall into the valley with a tremendous roar. "I saw it falling," writes Muir, "in thousands of the great bowlders I had so long been studying, pouring to the valley floor in a free curve luminous from friction, making a terribly sublime spectacle—an arc of glowing passionate fire, fifteen hundred feet span, as true in form and as serene in beauty as a rainbow in the midst of the stupendous roaring rock-

storm." He was thrilled by the phenomenon for he realized that by a fortunate chance he was enabled to witness the formation of a mountain talus, a process about which he had long been speculating.

Before the great bowlders had fairly come to rest he was upon the new-born talus, listening to the grating, groaning noises with which the rocks were gradually settling into their places. His scientific interest in the phenomenon made him so attentive to even its slightest effects that all fear was banished and he astounded his terrified fellow residents of Yosemite with his enthusiastic recital of his observations. They were ready to flee to the lowlands, leaving the keys of their premises in his hands, while he prepared to resume his glacial studies, armed with fresh clues to the origin of cañon taluses.

It was during the spring of this same year that he erected a log cabin for himself in a clump of cornus bushes, near the Royal Arches, on the banks of the Merced. The precise locality is to be sought at the point where the Merced approaches closest to the Royal Arches, and in a bold curve swings southward again across the valley. In the same neighborhood Lamon had also built his winter cabin. During the cold season of the year, when the south side of the valley is wrapped in the frosty shadows of its high walls, the sun shines obliquely against the talus slopes of the north side and generates a grateful warmth. Here, then, was Muir's second home in Yosemite Valley—one, however, that he seems to have occupied very little after 1874. The survival of Lamon's old corral in the immediate neighborhood has led to its identification with this last of Muir's cabins.

A subject that more than any other engaged Muir's attention during his residence in Yosemite was the question of the valley's origin. In 1870 we al-

Wide, shining, and rainbow waters of Vernal Falls

North Dome and the Merced through the valley

ready find him an advocate of the glacial erosion theory. To him, indeed, belongs the credit of having been the first to set forth this theory in a carefully reasoned form, supported by a mass of detailed observation. The paper of William Phipps Blake before the Paris Academy of Sciences in 1867 was based on hasty and inadequate field study. True, Clarence King as early as 1864 observed evidence of glaciation in the valley, but he continued to believe, in common with his chief of the California Geological Survey, Josiah D. Whitney, that the valley owed its origin to a great cataclysm. In any case he did not publish his glacial observations until his *Mountaineering in the Sierra Nevada* appeared in the spring of 1872. Then, in the chapter entitled "Around Yosemite Walls," he noted that one viewing the valley in its autumnal aspects "has crowded on him the geological record of mountain work, of granite plateau suddenly rent asunder, of the slow, imperfect manner in which nature has vainly striven to smooth her rough work and bury the ruins with thousands of years' accumulation of soil and débris."

Professor Whitney maintained that Yosemite Valley had been formed by block-faulting. ". . . the bottom of the valley sank down to an unknown depth, owing to its support being withdrawn from underneath," wrote Whitney. ". . . there is no reason to suppose . . . ," he asserted, "that glaciers have ever occupied the valley or any portion of it . . . A more absurd theory was never advanced than that by which it was sought to ascribe to glaciers the sawing out of these vertical walls and the rounding of the domes." Even in the higher regions outside of Yosemite he found no evidence of ice erosion, for, according to him, "Most of the great cañons and valleys of the Sierra Nevada have resulted from aqueous denudation."

"Based on entire ignorance of the whole subject," was the pungent and dogmatic fashion in which he dismissed the whole glacial erosion theory from his mind. Let me remind the reader that the man who expressed himself in this positive manner was chief of the California Geological Survey, and the only scientific man of acknowledged standing who up to that time had reached so decisive a judgment upon the facts. Besides, his conclusions were set forth in a volume "published by authority of the California Legislature." It required considerable courage, knowledge, and interpretative ability to enter the lists against such an antagonist.

But Muir accepted the challenge. Whitney's views, quoted above, as set forth in his *Yosemite Guide-Book,* probably became known to Muir in 1869, after his first summer in the Sierra. He at once recognized them as contrary to his understanding of the facts, but he took time to make a more careful geological study of the whole Yosemite region. All the time he could snatch from his occupation as sawmill operator and guide was employed in field study and exploration. Sundays, in particular, were devoted to what he calls "Sabbath raids among the mountains." The intensity of his application to his task and the progress of his studies are interestingly told in a letter of September 8, 1871, to his friend, Mrs. Ezra S. Carr.

"You know," he writes, "that for the last three years I have been ploddingly making observations about this valley and the high mountain region to the east of it, drifting broodingly about and taking in every natural lesson that I was fitted to absorb. In particular the great valley has always kept a place in my mind. What tools did He use? How did He apply them and when? I considered the sky above it and all of its opening cañons, and studied the forces that came in by every door that

Overhanging Rock giving view of Yosemite Falls

Courtesy of W. L. Huber

Looking eastward from the summit of Mount Hoffmann, Mount Dana on the skyline.—Muir visited Mount Hoffmann (11,000 feet elevation, about seven miles north of Yosemite Falls) during his first summer in the Sierra. In a volume dedicated to the Sierra Club of California he tells of this visit and the ambition that came to him then to understand better the "glorious landscape." In 1871 he camped one night on the summit of Mount Hoffmann with James Cross, of Oxford, England, and a Mr. Maxwell, of San Francisco. Beyond the summit this photograph shows a portion of the Tuolumne Meadows, the loveliest Alpine valley of the Sierra Nevada. Muir's glacial studies centered in and about this valley for several years

I saw standing open, but I could get no light. Then I said: 'You are attempting what is not possible for you to accomplish. Yosemite is the *end* of a grand chapter; if you would learn to read it, go commence at the beginning.' Then I went above to the alphabet valleys of the summits, comparing cañon with cañon, with all their varieties of rock-structure and cleavage and the comparative size and slope of the glaciers and waters which they contained; also the grand congregations of rock-creations were present to me, and I studied their forms and sculpture. I soon had a key to every Yosemite rock and perpendicular and sloping wall. The grandeur of these forces and their glorious results overpower me and inhabit my whole being. Waking or sleeping, I have no rest. In dreams I read blurred sheets of glacial writing, or follow lines of cleavage, or struggle with the difficulties of some extraordinary rock-form. Now it is clear that woe is me if I do not drown this tendency towards nervous prostration by constant labor in working up the details of this whole question. I have been down from the upper rocks only three days and am hungry for exercise already.

"Professor [John Daniel] Runkle, president of the Boston Institute of Technology, was here last week, and I preached my glacial theory to him for five days, taking him into the cañon of the valley and up among the grand glacier wombs and pathways of the summit. He was fully convinced of the truth of my readings and urged me to write out the glacial system of Yosemite and its tributaries for the Boston Academy of Science. I told him that I meant to write my thoughts for my own use and that I would send

him the manuscript, and if he and his wise scientific brothers thought it of sufficient interest they might publish it.

"He is going to send me some instruments, and I mean to go over all the glacier basins carefully, working until driven down by the snow. In winter I can make my drawings and maps and write out notes. So you see that for a year or two I will be very busy. . . . Some of my friends are badgering me to write for some of the magazines, and I am almost tempted to try it, only I am afraid that this would distract my mind from my work more than the distasteful and depressing labor of the mill or of guiding. What do you think about it?

"Suppose I should give some of the journals my first thoughts about this glacier work as I go along and afterwards gather them and press them for the Boston wise; or will it be better to hold my wheesht and say it all at a breath?" Fortunately he decided not to hold his "wheesht"[1] but wrote out his "first thoughts" which appeared in the New York *Tribune,* December 5, 1871. In addition to Mrs. Carr, he also furnished, during the preceding summer, information about his discoveries to Clinton L. Merriam and J. D. Runkle. The latter, it seems, turned over the letters to his colleague, Samuel Kneeland, who made a use of them which Muir did not wholly approve, for in October, 1872, he wrote to a friend, "Professor Kneeland . . . gathered some letters I sent to Runkle and that *Tribune* letter, and hashed them into a compost called a paper for the Boston Historical Society, and gave me credit for all of the smaller sayings and doings and stole the broadest truth to himself."

Professor Kneeland, however, made some amends in the revised edition of his book, *The Wonders of Yosemite Valley* (1872) in which he referred to Muir as "the presiding genius of the valley, the high priest of this temple of nature," and pointed out justly that what others had seen on a limited scale, "Muir has examined on a very large scale, having traversed the upper Sierra in all directions, and ascertained the existence of a glacier system . . . whose size and direction had previously been rather guessed at than determined."

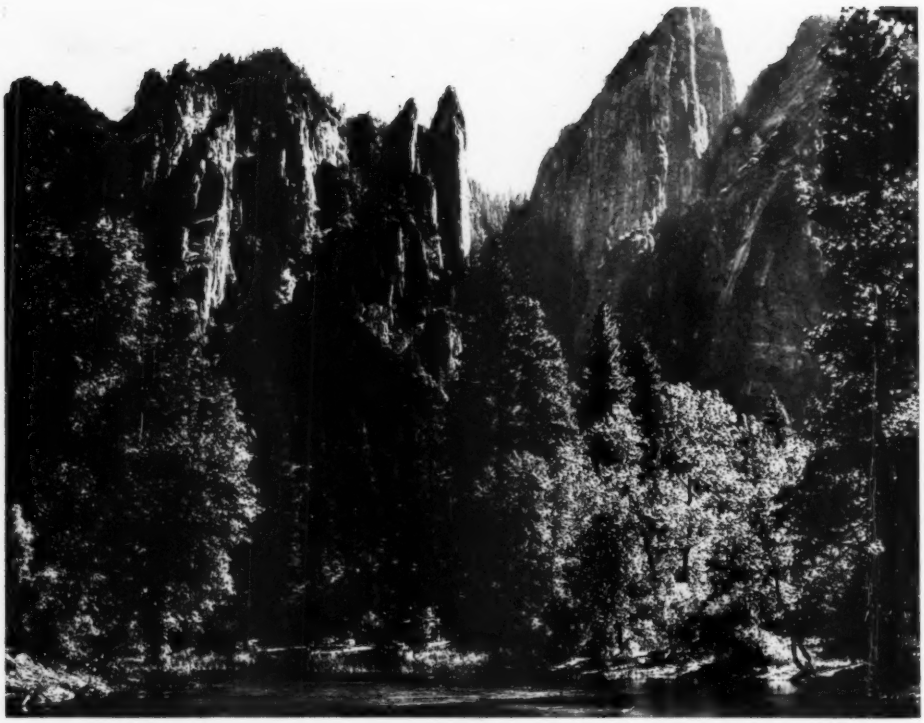
[1] A Scotch word for silence.

Courtesy of W. L. Huber

The needle on the west face of Cathedral Peak, Yosemite National Park

About this time Muir came into friendly relation with several scientific men of his time, foremost among them being Asa Gray, John Torrey, and Louis Agassiz. Agassiz was then the world's leading authority on the subject of glaciers. When Mrs. Carr (see page 133) showed him the "glacial letters" of her Yosemite correspondent, he became enthusiastic and declared that Muir's knowledge of glaciation exceeded that of any one whom he knew.

For two more years Muir continued



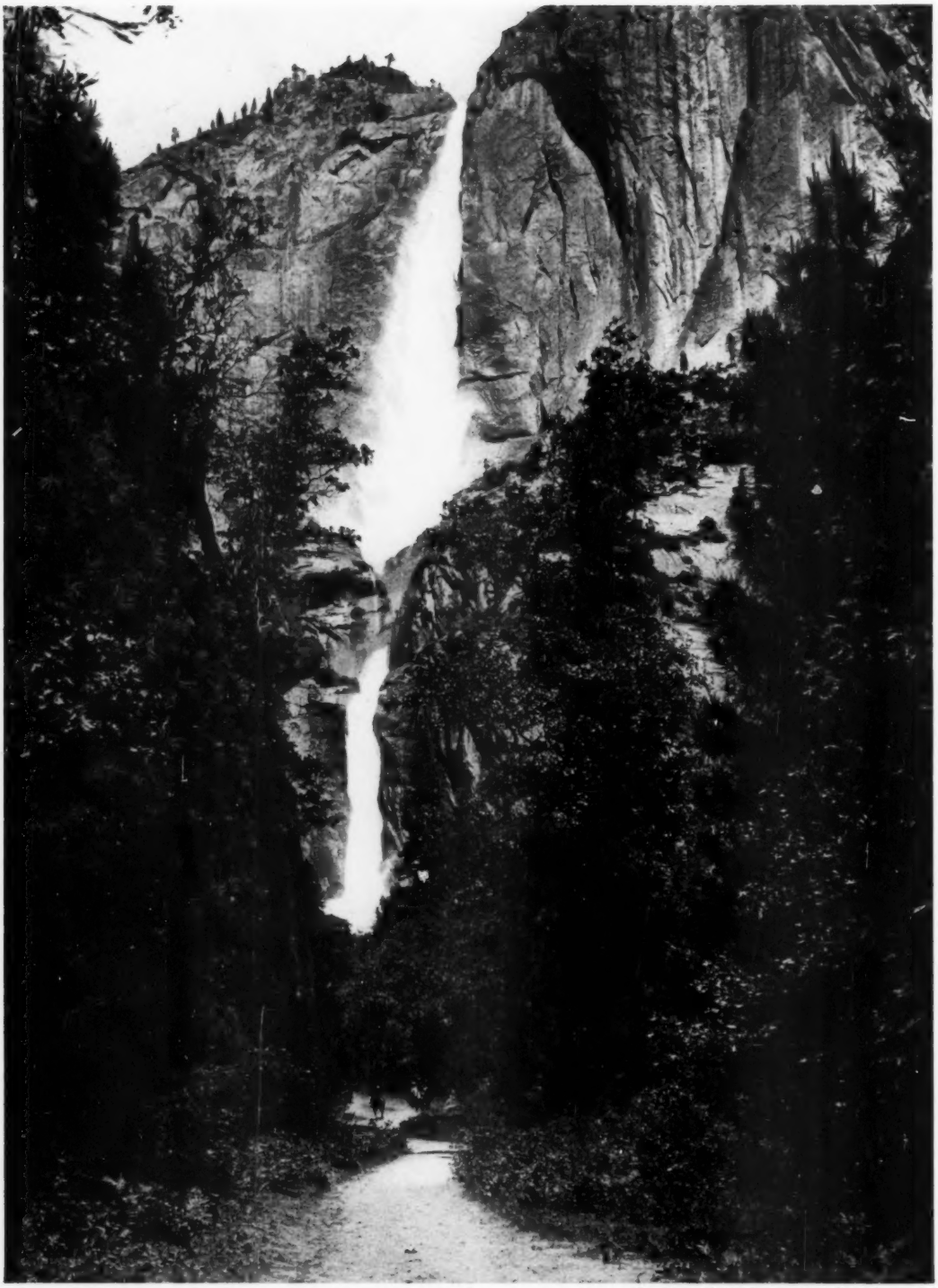
Cathedral Spires.—The spires and domes of Yosemite were carved out during the centuries they lay in darkness under the moving, crushing ice of glaciers. The preglacial landscape was destroyed; Muir delights in emphasizing that the destruction was creation. Just where the glaciers "crushed most destructively" are the most beauty and warm life today,—and even today under other forces, fast or slow, Yosemite's domes and spires are vanishing away

his glacial studies in and about Yosemite and then published his results, in 1874, in a series of seven remarkable articles in the *Overland Monthly*. They were illustrated with line drawings and have remained the most detailed and comprehensive studies[1] of the glaciation of the Sierra Nevada published thus far. It was unfortunate that they were not immediately gathered into the form of a book so as to be easily accessible to subsequent investigators. But the Mount Shasta region, Nevada, Utah, and Alaska soon began to absorb his interest, and he never managed to revise and prepare them for book publication.

During these studious Yosemite years, however, he learned to regard the surface of the earth almost as a living organism, and he was ever keenly interested to trace individual features of the earth's topography through progressive modifications of form and aspect to the point where the cycle of evolution might be said to have run its course. "Nature," he said, "is ever at work building and pulling down, creating and destroying, keeping everything whirling and flowing, allowing no rest but in rhythmical motion, chasing everything in endless song from one beautiful form into another." So impressed was one great geologist with Muir's vivid sense of this tendency to change that he felt sure, to use his words, "a popular physical geography by John Muir would usurp the place of the novel in the public library."

[1] They are now in process of republication in the *Sierra Club Bulletin*.

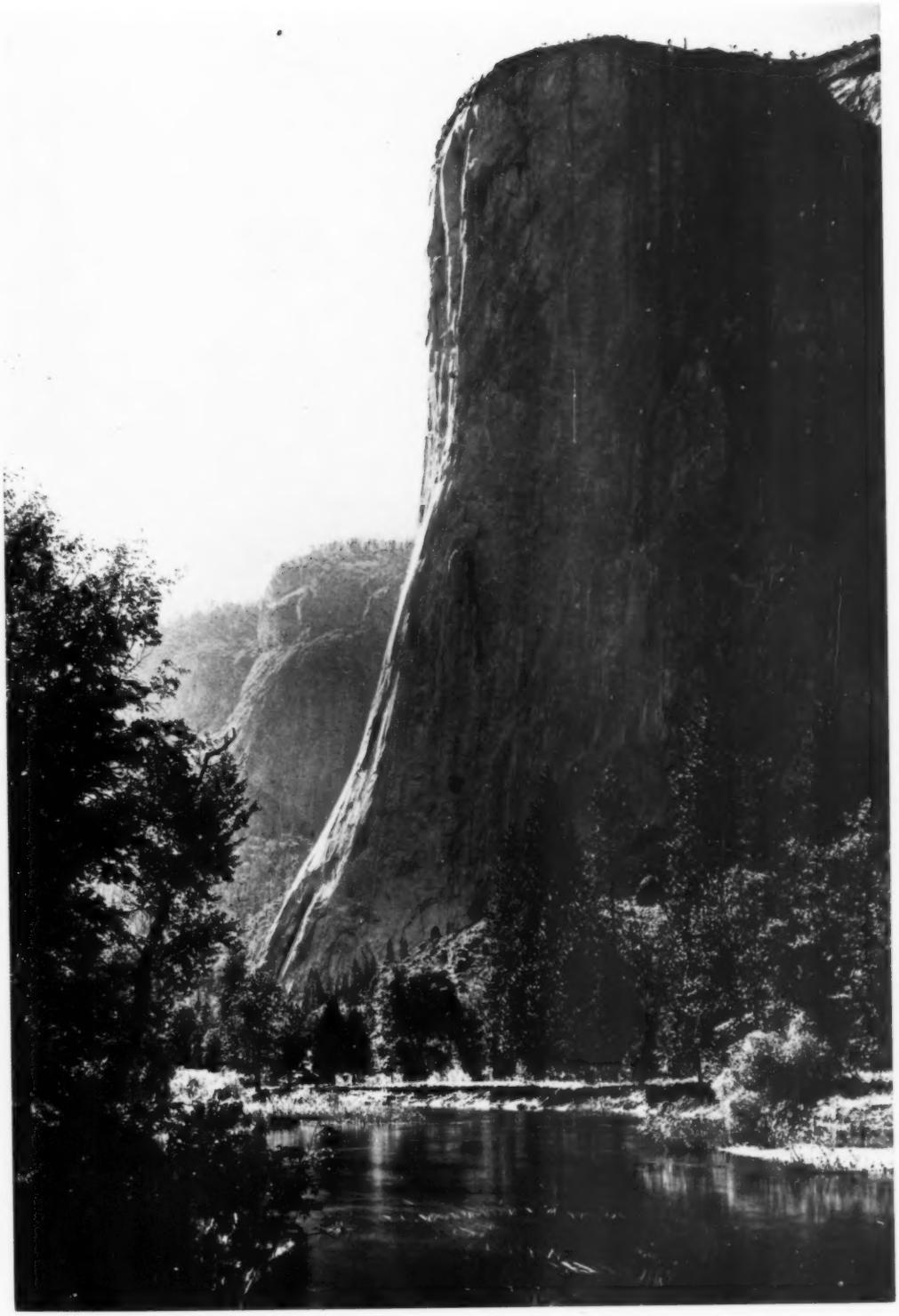
GLACIER-SCULPTURED SENTINEL ROCK OF YOSEMITE VALLEY



Courtesy of Underwood and Underwood

UPPER AND LOWER YOSEMITE FALLS

The booming, reverberating thunder of Yosemite Falls can be heard five or six miles away; it fills the valley, yet not until we reach Sentinel Rock do we see the whole half mile of falling water. Yosemite Falls are near the middle of Yosemite Valley, which is the heart of Yosemite National Park



EL CAPITAN'S IMPOSING FRONT OF GRANITE, ABOVE THE "RIVER OF MERCY"

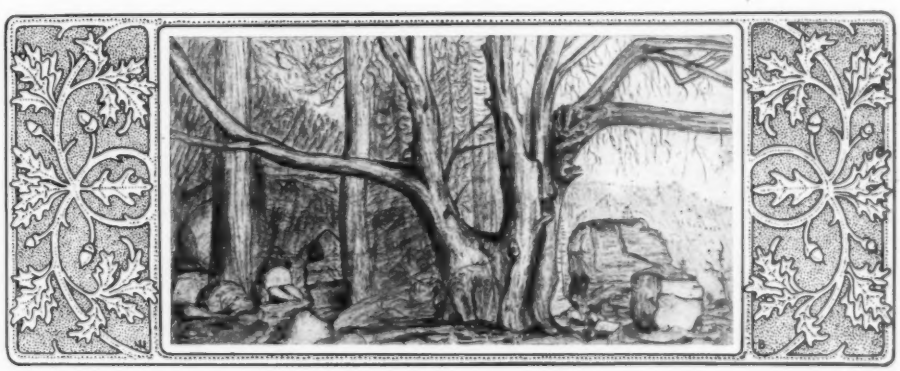
JOHN MUIR

From a bust in bronze by Miss Malvina C. Hoffman, sculptor, which has recently been placed in the woods and forestry hall of the American Museum

Perhaps we cannot do better than to conclude this sketch with two paragraphs from his notebook of 1871. He had passed a beautiful September day in Yosemite Creek basin, tracing the pathway of an ancient glacier, and describing its gradual death where two freshly polished domes were reflected in two new-born moraine lakes. There night had overtaken him, and according to his custom he sought repose under the stars, but not before he had paid the following tribute to the beauty of his surroundings:

"How softly comes night to the mountains! Shadows grow upon all the landscape; only the Hoffmann Peaks are open to the sun. Down in this hollow it is twilight, and my two domes, more impressive than in broad day, seem to approach me. They are not vast and over-spiritual, like Yosemite Tissiack, but comprehensive and companionable, and susceptible of human affinities. The darkness grows, and all their finer sculpture dims. Now the great arches and deep curves sink also, and the whole structure is massed in black against the starry sky.

"I have set fire to two pine logs, and the neighboring trees are coming to my charmed circle of light: the two-leaved pine, with sprays and tassels innumerable, the silver fir, with the magnificent fronded whorls of shining boughs, and the graceful nodding spruce, dripping with cones, and seeming yet more spiritual in this camp-fire light. Grandly do my logs give back their light, slow gleaned from suns of a hundred summers, garnered beautifully away in dotted cells and in beads of amber gum; and, together with this outgush of light, seem to flow all the other riches of their life, and their living companions are looking down as if to witness their perfect and beautiful death. But I am weary and must rest. Good-night to my two logs and two lakes, and to my two domes high and black on the sky, with a cluster of stars between."



Sketch of a live oak (not heretofore reproduced) which grew near Muir's Yosemite cabin. To try to draw the trees and rocks of the high Sierras was his natural instinct. He spent many days sketching on North Dome—"perched like a fly," he said, on the granite surface—from which nearly all the valley is visible. "I would fain draw everything in sight. But little can I do beyond mere outlines—readable only to myself. Whether these picture-sheets are to vanish like fallen leaves or go to friends like letters, matters not much; for little can they tell to those who have not themselves seen such wildness, and like a language have learned it. No pain here, no dull empty hours, no fear of the past, no fear of the future . . . . no personal hope or experience has room to be."—From *My First Summer in the Sierra*. (The drawing is used through the courtesy of Mrs. Emily Pelton Wilson, of Pasadena, to whom Muir sent it in the seventies)

"The Manhattan Medical School"

Only a dream today, but its achievement would be an honor to the City and a benefit to the medical culture of the world

By GRAHAM LUSK

Professor of Physiology, Cornell University Medical College, and Scientific Director of Russell Sage Institute of Pathology

THE war in Europe led to a great transfer of the world's wealth to America. For months before the war our people were considering military preparedness.

There is another form to which our energies should turn and that is our own intellectual preparedness. It is fitting to remember that the best blood of England, France, and Germany has been lost. The younger generation which was to carry on the standards of civilization, of art, science, and literature, has been in part annihilated. Kipling's son, Osler's son, Sir Edward Schaefer's son, are dead, and so on by the tens of thousands.

It is not financial wealth alone that America possesses. She also has scholars who have been trained in England, France, and Germany, who have brought the knowledge of those countries here, and who have by their activities enlarged the scope of the world's intellectual progress. The process has continued so that the United States now affords training in almost every branch of intellectual world endeavor. But such opportunities fall far short of the necessities of the time.

We Americans who know of the movements of the modern educational world should wish to preserve intact the opportunities which have existed in Europe for advanced study and research, and not risk the possibility that these things pass away and become forgotten, even as Science and Art decayed after the Thirty Years' War.

The project which is to form the argument of this paper is the mobilization of the medical resources of New York City for the foundation of a great medical school which will be an honor to the city and a benefit to the medical culture of the world.

There are three medical schools in New York City, all classified by the American Medical Association as belonging to the first class. One or two of these could be developed into educational institutions which would be truly worthy of our national greatness. A medical school of the best type is a welfare center. It confers its blessings not only upon the hospital patients who have treatment by its distinguished professors, but it also sends forth highly trained men who have to do with the health and often with the morals of the whole community.

The public benefits conferred by modern science have been greatly underestimated in this country. Medicine can advance only by the scientific method. A well-known clinician recently complained that his students were no longer taught the proper things, that they no longer understood the significance of the heart sounds. On the face of it this seems dreadful. But the truth of the matter is that while the older clinicians *thought* they knew the significance of the heart sounds, a younger and more critical generation is using all the modern instruments at hand and all the intellectual reasoning power it possesses to obtain valid evidence of the significance of the heart sounds, and yet finds itself still groping in the dark. It is in the laboratories, with their exact methods of analysis, that accurate interpretation is to be sought. So a great medical school must be founded on a scientific basis if it is to fulfill its mission in the world.

It seems that it would be wise to support the interests devoted to teaching medicine in New York to the

end that a powerful national influence may be exerted for making the standard of medicine the best in the world.

It would require $30,000,000 added to existing resources[1] to create a great Manhattan Medical College. Property worth $60,000,000 would closely approximate the total resources of Columbia University today. To the objection that $30,000,000 is too large a sum to be used for such a purpose as the elevation of medical standards in this country, let it be remembered that it is less than one half the cost to the United States of one day of war and scarcely more than the cost of a single battleship. And yet this sum, if properly used, would establish forever an asset of incalculable value for the health and welfare of the people. The budget of the Carnegie Nutrition Laboratory is $50,000 a year, a large sum from a princely endowment, and it is only half of one-thousandth part of one per cent of what the American people spend annually for food. It has been estimated that the economic loss to the United States from typhoid fever and malaria amounts to a billion dollars a year.

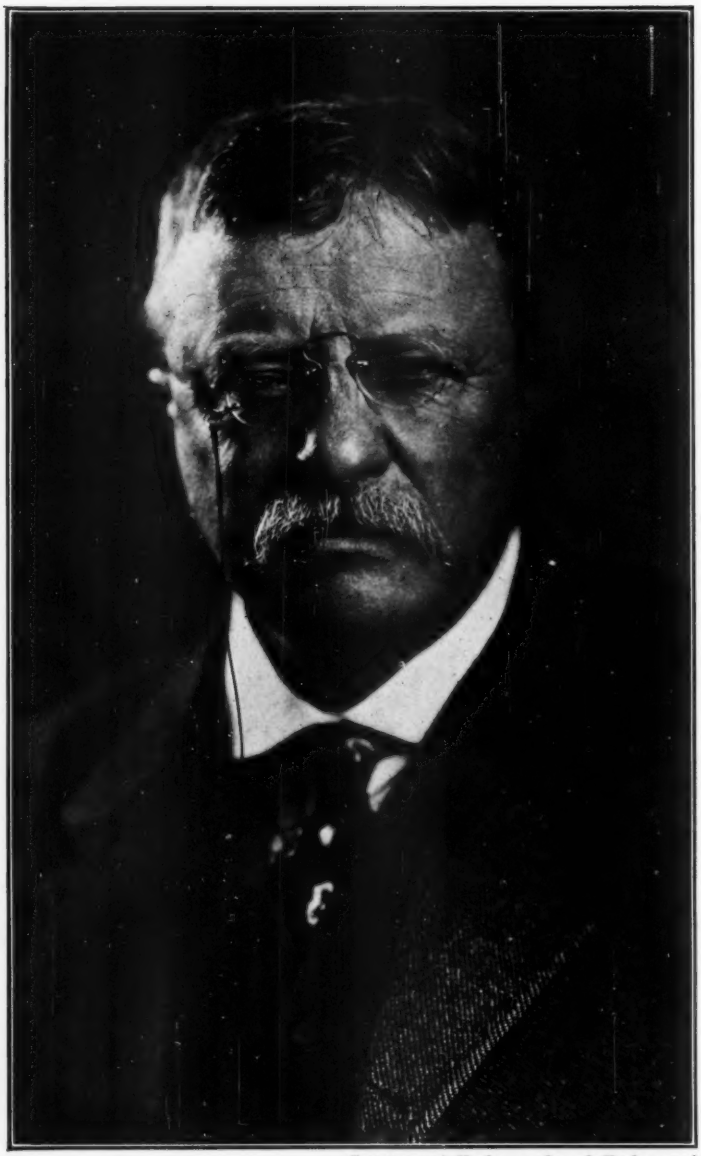
If a New York or Presbyterian hospital could be built and substantial laboratories constructed near it, the necessary physical equipment would be provided. A large amount of income should be spent in supporting men of brains. With the low rate of salaries prevailing among the laboratory men it would be easy to guarantee the continuance of their present salaries in any new institution, or at least to protect such laboratory men as accept no outside fees for their services. There is no question that if the success of this scheme were to depend upon it, the professors in the clinical branches who are almost universally in receipt of incomes far in excess of their academic salaries, would tender their resignations so that such clinical departments as are not properly organized could be reorganized on the basis of the best that the country affords.

The laboratories of such a school should be devoted to pure scientific investigations. Permission to do outside work for private pay within university laboratories has wrecked many a promising scientific career. Some of the clinical professors, perhaps those associated with the New York or Presbyterian hospital, might be kept free from private practise. Others, perhaps those associated with Bellevue Hospital, could be allowed to practise medicine after four hours of service daily in the hospital, but such men should receive little or no salary, although their staffs should be full-time men. An exception to these rules might be made in permitting outside work if this were done in the service of the state. The state could then command the service of a body of disinterested experts and this would be of great value in the administration of justice.

If a new Manhattan Medical School maintained two clinics in medicine and students were allowed to attend whichever course they chose, an element of competition now lacking would be introduced. In the same way with the subject of chemistry, one set of men could give a course lasting four months to be followed by a course given by another set of instructors. The same laboratory could be used. Each instructor would then be free for research work at least six months in the year. The student could choose the course he preferred, the better students, of course, being given the first choice.

The venture should be largely in the hands of university men, teaching students who have had at least a certain amount of university training and it would be a credit and a glory to the city of New York.

[1] The existing resources are already respectable. The cost of the new Bellevue Hospital, which is largely used for teaching, is estimated at $8,000,000. The combined resources of the New York and Presbyterian hospitals, which both enjoy the benefits of medical college affiliation, are $12,000,000. The medical schools themselves own property and endowments not far from $10,000,000. This makes a total of $30,000,000.



Courtesy of Underwood and Underwood and Doubleday Page and Company

THE BEST KNOWN PORTRAIT OF ROOSEVELT

It is thought by some that this portrait of the late Colonel Theodore Roosevelt was his first choice. It chances that NATURAL HISTORY has never included it among the numerous portraits of Roosevelt previously published and is glad to present it at this time for the excellence of the portrait itself, and as a record. Mr. Abbott uses it as the frontispiece of his book. Everyone who reads this book will be impressed with the simplicity and sincerity of it, and the vast new matter presented; and will appreciate also the author's aim "to supply some useful details for the final portrait which will be painted by the historians of the future"

Lawrence Abbott's "Roosevelt"[1]

By HAMLIN GARLAND

Member of the American Academy of Arts and Letters

LAWRENCE ABBOTT'S *Impressions of Theodore Roosevelt* is not correctly named. It is not a series of impressions but an authentic, indisputable record. Few men had the opportunity for studying Roosevelt at such close range, in such diverse fields of activity, and from day to day, as the writer of this book enjoyed. There are many to claim friendship with Roosevelt, but few who are as fully entitled to that distinction as Lawrence Abbott of the *Outlook*.

Although unassuming in its title, this book is of such value that it cannot be overlooked by any future historian. Without especial distinction of style and almost without construction, it nevertheless tells the reader just what he wishes to know concerning certain disputed points of Roosevelt's career. Its calm statement of fact with regard to the relationship of Taft and Roosevelt, for example, shows the large-minded action of Roosevelt at one stage of the controversy.

"He was always ready to renew friendly relations with an antagonist," Abbott writes, "unless they had been broken because of some fundamental vicious streak in his opponent which could not be remedied by any kind of readjustment."

New light is also thrown on the campaign of 1912, and on the Panama project, wherein Roosevelt's action is still a matter of dispute even among his friends. My own concern about these subjects is that of interest in the character of Roosevelt. Political issues are vital now only by reason of his participation in them. In Abbott's account the reactionaries are made responsible for the division of the Republican Party in 1912 (according to material here offered for the first time) and Roosevelt is shown to us in the act of refusing to compromise in the slightest degree on the moral question involved in the great struggle in Chicago. This is one of the most important and stirring passages in the book, for it shows Roosevelt in his highest mood as a political leader.

He was a redoubtable warrior, but he was a manly and generous warrior. He was, as the saying goes, a "good sport." To the man who fought fair he had only praise even if he was worsted by him, but the man who hit below the belt was not forgiven. The question "Who was responsible for the wreck of the Republican Party in 1912?" will be answered according to the reader's prejudices, no doubt, but Abbott confirms my own convictions in the case by presenting the documents which are needed in the final judgment.

In the famous dispute concerning the Guildhall speech Abbott's testimony is again of definitive character. Roosevelt wrote his Guildhall speech during his journey of six or eight weeks in Europe, declares Abbott. "He sought and accepted suggestions as to form and phraseology—this I know, because at his request I read the speech two weeks before it was delivered." This should dispose of the criticism that it was "a piece of Rooseveltian impulsiveness." In truth it was exactly a characteristic piece of Roosevelt *preparation*. Impulsive in action, he brooded over his problem with complete concentration before he

[1] *Impressions of Theodore Roosevelt*. By Lawrence F. Abbott. Published by Doubleday Page and Company, 1919.

Courtesy of Doubleday Page and Co.
From a photograph of Roosevelt taken in 1912 at his desk in the office of the *Outlook*

acted. His leap was swift but his preparation deliberate.

The parts of the book which are of most interest to me, however, are those which touch upon Roosevelt's love of books and of nature. In these he was at his highest and best. They tell of the Roosevelt I knew, the Roosevelt who could write like this: "Across the lonely wastes the sun went down. The sharply channeled cliffs turned crimson in the dying light. All the heavens flamed ruby red and faded to a hundred dim hues of opal, beryl, and amber, pale turquoise and a delicate emerald; and then night fell and darkness shrouded the desert."

This passage recalls to me a talk we once had concerning the beauty and loneliness of the Bad Lands of Dakota. For a man of infinite and endless activity, he was singularly contemplative. He had his moments when he was but a mind in the midst of wild scenes, and reacting to wild voices. On most themes his manner of writing, while clear and forceful, is lacking in grace, in charm, but when he wrote of nature, of the wilderness, his prose was often impassioned almost to the point of poetry. Some parts of his book on Africa, and especially certain passages in *A Book-lover's Holidays in the Open,* have a vibrant rhythm which adds to the truth of his description a lasting musical charm.

Abbott's division of Roosevelt's personal qualities under the heads of Caution, Courage, Humor, and Gentleness, will come as a surprise to many who knew only one side of the man. His courage and his humor most men know, but few know, as Abbott knew, the gentle and chivalrous side of Roosevelt.

It is significant and helpful to find the book ending on this note: "Theodore Roosevelt's personality was an unsurpassed combination of the unterrified fighter of what he believed to be the worst, and the tender-hearted lover of what he believed to be the best in mankind." And, in another place, Abbott says, "There was not a tinge of jealousy in his disposition. He was not a philosopher, he was simply human. He took the hard knocks of life not with resignation but with a kind of boyish zest and joy."

In short, Abbott presents in this book the Roosevelt I knew, but with a fullness of observation which was denied me. It is a delightful as well as an authoritative record.

Application of Psychological Tests in Army Camps[1]

By GEORGE F. ARPS

Ohio State University; lately Major, U. S. A., Chief Psychological Examiner, Camp Sherman, Ohio

In considering the subject "Psychological Tests in Army Camps," it is understood that I am here detailing the service rendered by the psychological examining station at Camp Sherman, Ohio. What was done at Sherman is fairly typical, I think, of the procedure and results attained wherever psychological examining stations were in complete operation. So far as this may be the case, I am permitted to speak for the service in all camps where the psychological service was made available.—THE AUTHOR.

IF it was important that America discover quickly the best brains among her recruits and assist in placing those competent in positions of leadership and responsibility commensurate with the enormous task then confronting the nation, if it was important to weed out the relatively "dead" brains that endangered the lives of those engaged in the combatant units of the military service, and if it was important to increase the efficiency of all extra military organizations engaged in promoting military efficiency, then the psychological service, it may pardonably be said, made a valuable contribution to the military arms of the nation.

Hundreds of thousands of young men from practically every known occupation poured like a stream of immense volume into the various army cantonments, there to be speedily organized into companies, battalions, regiments, and divisions. The multitude being assembled, the concrete problem of whipping and shaping this huge mass into an effective fighting machine within a few months confronted American genius.

Obviously the reduction of this mass of men, representing the most divergent interests, divergent social standing, divergent occupations, divergent nationalities, into an orderly, disciplined fighting machine, was a plain matter of selecting the best brains for positions of leadership, of selecting men of decision, clear vision, conviction, energy, determination,—in short of selecting men unmistakably possessed of superior intelligence and of unimpeachable integrity. These men to the extent of tens of thousands were indispensable as commissioned and noncommissioned officers.

How to select the most intelligent, how to select them quickly and with the minimum of error, were among the immediate pressing problems. Upon the officers, and especially upon the noncommissioned officers, devolved the problem not only of reducing this conglomerate, inarticulate aggregation of independent, undisciplined American young men into an army of disciplined soldiers, but upon the officers fell also the important work of developing military morale, stamina, and spirit. These elements, all more or less latent with respect to mass action, considered from the military point of view depend almost altogether for their development and coördination upon the commissioned and noncommissioned officers.

The *first* and most important service which a psychological examining station renders consists in furnishing commanding officers with a mental rating of every recruit as soon as possible after his induction into the service. These ratings are entered on the service records of every soldier and may be consulted by the commanding

[1] A paper read before the American Psychological Association, 1918.

officers before selecting noncommissioned officers; by the authorities charged with the duty of selecting the best material for the various officers' training schools; and by officers in balancing organizations—and in many other ways. This procedure constitutes a short and practically accurate method of selecting the type of man necessary for the construction of a modern army in record time. It is infinitely superior to the method of rough observation and guess which of necessity prevailed, more or less, prior to the introduction of psychological tests. In speaking of the "guess method" one commanding officer remarked: "I have given up trying to estimate intelligence by observing 'anatomical topography' and various other phrenological symptoms of mentality."

The standard for admission to any officers' training school—infantry school of officers, machine-gun school, artillery school, quartermaster school, and signal school—was almost entirely confined at Camp Sherman to candidates who were *very superior* and *superior* men mentally as determined by the intelligence tests. It does not follow that all candidates so rated were selected, for the psychological tests are by no means free from error. Moreover, there are other *very important* factors which help to determine a candidate's total value to the service; these must be considered in conjunction with the intelligence factor in determining fitness for commissioned service.

It was the opinion at Sherman that, in view of the supply of superior and very superior men, and, in view of the fact that a noncommissioned officer, under emergency circumstances, may assume direct and independent command, the intelligence qualification for the noncommissioned officer should closely approximate that of the commissioned officer. There was a distinct trend in this direction in the minds of certain of the military authorities at Sherman. Had the war continued, it is not unlikely that most interesting developments would have resulted in the division forming when the armistice was signed. In one division, at least, it was very probable that the intelligence curve of the noncommissioned officers would have paralleled that of the commissioned officers.

These statements gain enormously in significance when we reflect that in a single organization about fifty noncommissioned officers and first-class privates were sent to the school for illiterates. The consequences of leadership of this degree of intelligence do not involve a serious task on the imagination; on the other hand, it may strain considerably the feelings and confidence of those vitally concerned with the welfare of the men commanded.

The *second* important service rendered by the psychological examining station consisted in rating all commissioned officers below the rank of major in the camp. A number of commissioned officers requested the examination of their entire commands, including men of higher rank. This was our recommendation in view of the fact that candidates for the various training schools must have, as a rule, an "A" or "B" ("very superior" or "superior") rating and that promotions into the higher ranks are quite generally made from the lower. There were other reasons, but these appeared sufficient to justify the recommendation. All this is obvious from the procedure in the camp surgeon's office with respect to the promotion of commissioned officers into higher grades. For example, a lieutenant up for a captaincy appeared before a committee, of which the surgeon was chairman, for examination. This was at first done independently of the intelligence rating. The results of the initial work of the committee showed the very interesting

fact that every man promoted had received an intelligence rating according to the psychological tests of "A" or "B," and that every officer, with one exception who failed to receive promotion had been rated below "B" in intelligence. Thereafter, the work of the examining committee was considerably abbreviated and no candidate for promotion appeared before the committee in advance of the results of mental examination.

A *third* service by the Camp Sherman station made possible the conduct of the development battalion schools along lines of accepted modern pedagogical procedure. A complete plan of procedure and organization was presented to the battalion school officer who at once accepted the plan. The administration of these schools was made possible by memoranda issued by headquarters of the depot brigade. According to this plan, the teachers were selected by means of psychological tests; the student soldiers were initially classified according to their intelligence ratings, thus securing a fairly uniform tempo of learning for each class. After two or three weeks of actual classroom experience the men were re-classified. The armistice interrupted, almost at its inception, what appeared to give promise of being an extremely valuable educational experiment, upon which those concerned with the problem of illiteracy and with the Americanization of our foreign population could very profitably bestow at least one intelligent moment.

Fourth.—The psychologists assisted the psychiatrists in eliminating low grade mentals whom it would be dangerous to retain in any line organization. Frequent assistance was extended the division psychiatrist in making a final survey of units about to leave for overseas.

At a later date when the psychological examining stations were more completely organized, the recruits, as they entered the receiving depots, were thoroughly combed so that only an occasional low grade succeeded in getting by the psychiatric and psychological examiners. Thus was the army made mentally as well as physically "fit to fight."

It is obvious from the above that the psychological service played its rôle in the all-important problem of selecting the *best brains* for positions of leadership on the one hand, and, on the other hand, in the elimination from active line duty of the puny, putty brains so well calculated to gum up the military machinery.

Fifth.—The commanding officer of the base hospital requested a complete survey of his personnel. This included commissioned men of all grades, all noncommissioned officers, and all enlisted men. The camp adjutant made use of intelligence ratings to a very large degree in assigning enlisted men to base and evacuation hospitals organizing for overseas duty.

Sixth.—As in the case of the base hospital, the commanding officer of the medical department of the depot brigade requested a survey of his organization. Here, as elsewhere, most of the noncommissioned officers were selected before the psychological work was in full operation, which accounts for the relatively large number of intelligence grades below that of "B." The value of this survey is indicated by the commanding officer's communication which is fairly typical of the medical attitude. He says:

"It is now the procedure in this department to selcet, as likely men for training with a view to advancement, those who show an intelligence from High Average up, giving proper value, of course, to such other factors as application, personality, physical qualities, etc. It seems sure that this will obviate selection and, later, failure to make good of some who might otherwise creep in."

Seventh.—By request of the division and camp surgeon all members of the army nurse corps and the student army nurses were examined. The Colonel, in making the request, emphasized the very great importance of the intelligence factor in the nurse service. The tests were of value in organizing the service and in making assignments to places of greater opportunity and responsibility.

Perhaps it should be emphasized again that the psychological tests lay no direct claim to measurements of such factors as

reliability, determination, grit, industry—all very important factors in arriving at the total value of any person in the military service.

Eighth.—The psychological service was placed at the disposal of the commanding officer of the prison ward and the camp psychiatrist in examining all base hospital prisoners and drug addicts. Intelligence ratings functioned to some extent in determining treatment (not medical), and in furnishing assistance as to the ultimate disposition of these unfortunates.

Ninth.—At the earnest solicitation of the commanding officer of the camp of conscientious objectors the psychological board made a fairly complete mental and sociological report on each man who classified himself as conscientiously opposed to military service. While recognizing the existence of the genuine objector, it is preferable to remain within the bounds of printable English and refrain from comments applicable to a very considerble proportion of this unsavory group.

How the psychological ratings functioned in the interpretation, disposition, treatment, and understanding of this motley aggregation of disparate elements can best be portrayed in a blanket statement of their commanding officer. He says, "It is not extravagant to say that the intelligence rating and survey of each case have been almost invaluable. I do not hesitate to say that without this information I could well be compared in the conduct of my work to a blind man groping in the dark for an unseen goal."

Tenth.—By camp memorandum the entire personnel of the quartermaster department, the remount station, the guards at the German prison camp, and all other military organizations which had not previously requested examination, were surveyed and reports forwarded to the proper commanding officers.

Eleventh.—All candidates for (1) infantry officers' school, (2) machine-gun school, (3) artillery school, (4) quartermaster school, and (5) signal school were given psychological tests and the results used in determining entrance to these various schools. The president of the examining board makes the following comments: "It is the unanimous opinion of the Board that an intelligence rating is *the* one most reliable index, in that a quantitative statement is available and in that rough observation is effectively checked. The psychological rating is, therefore, considered of primary importance."

Twelfth.—Camp Sherman had but one officers' training school, the fourth. The psychological board furnished the commanding officer at his request an intelligence rating for each man in the school for whom there was no rating. It was the commanding officer's opinion that the intelligence ratings were of the highest value to the military service; he suggested that the examination be given simultaneously to all units of a division as soon as possible after organization.

Thirteenth.—The division and camp surgeon of the eighty-fourth division requested a rating of his office personnel, as did likewise his successor.

Fourteenth.—The psychological service extended beyond the strictly military organizations. The social workers and the chief medical health officer enlisted this service in the examination of a considerable number of prostitute and questionable women who, as is well known, infest the immediate environs of army camps.

Many examinations were made in the county infirmary where the women were quarantined pending treatment and ultimate disposition; others, fewer in number, were examined in the county jail and in the city bastile. Whenever possible a psychiatric examiner accompanied the psychologist. A combined report was then forwarded in duplicate, one to the health officer and one to the chief social worker. This service was continued to the very close of the psychological work.

Fifteenth.—The general secretary of the Young Men's Christian Association desired a survey of his personnel in the hope of increasing the effectiveness of his organization. It was the secretary's idea to employ intelligence ratings in the assignment of men to varying types of work. It was his suggestion that all prospective "Y" workers be given psychological tests in advance of appointment. Moreover, it was expected that the tests would aid in eliminating candidates possessed of excessive emotionalism.

Sixteenth.—A service similar to that performed for the Young Men's Christian Association was extended to the Knights of Columbus organization. The general secretary

remarked: "It would be of great service to us if you would kindly give tests to candidates for positions with our organization; their employment could then be made with the psychological results in mind."

Seventeenth.—As in the case of the Young Men's Christian Association and the Knights of Columbus, the Jewish Welfare Board was examined with similar objects in view.

Eighteenth.—By permission of the camp commanding general about two hundred German war prisoners were given the psychological examination.

In addition to the above organizations, fourteen heads of educational institutions in the regional directorship comprising the states of Ohio and West Virginia requested psychological examinations of members of the student army training corps. The paralytic effect of disapproval prevented the immediate realization of a piece of work which appeared of great importance to those familiar with the selection of candidates for officer training schools.

Practically the same unhappy fate befell the urgent request for assistance in the selection of candidates for officers' training schools by the commanding officer charged with this duty at the Columbus, Ohio, army post.

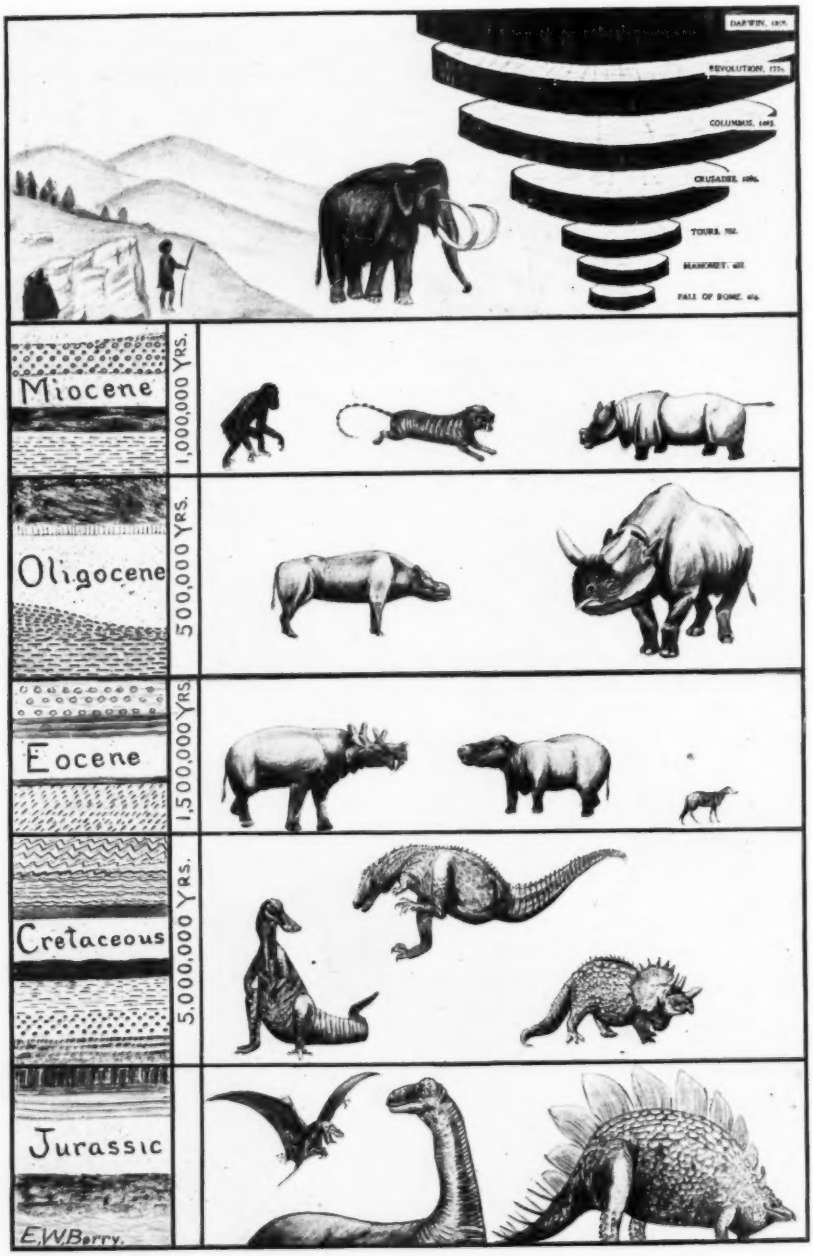
The various lines of activity thus briefly indicated cover in a general way the work of the psychologist in army camps. Touch any phase of any line of the army service and the question of intelligence at once pops into the foreground. Diagnose the wrongs and complaints of the Army, analyze the complaints of the buck privates, noncoms, and commissioned officers! Almost invariably they are traceable to an insufferable lack of intelligence, misplacement of men, and practically not at all to ignoble intentions, save as such intentions emerge from wingless brains.

Concerning the utility and perversions of army discipline, one buck, in response to a questionnaire, replied: "It all depends upon how much brains God gave the officer." It was also suggested that plumbers, blacksmiths, and skilled machinists were hardly suitable in army kitchens, and that the kitchen detail "should have sufficient intelligence to unharness the horses before they cook them."

Ignorance and stupidity are the breeding grounds of nine tenths of all grievances in the Army. This is implied in one officer's criticism to the effect that the Army "had 50 per cent officers and 100 per cent men."

It is apparent that selection through scientifically devised mental tests, for native ability, that is, innate capacity, inborn talent, is equal in importance to physical fitness and to fitness as determined by tests for conventional learning. Such traits as common sense, judgment, reasoning, and attentive control are matters of endowment and cannot be measured by the ordinary methods of examination common to every step of the educational ladder from the primary grade to the highest technical institution of learning.

For the introduction and approval of the psychological service the nation is indebted to the genius of General Gorgas, Surgeon General of the Army at the outbreak of the World War, and to the vision of Major Robert M. Yerkes, at the time President of the American Psychological Association.



CONTEMPORARIES OF THE SEQUOIAS

Above at the right, are shown a series of tree sections illustrating the growth of a single living big tree (*Sequoia gigantea*) in relation to human history. The largest of the trees in Sequoia National Park had sprouted before the first Olympiad, 776 B.C., or before Carthage was founded.

Below, is given a partial geological section in which are grouped the animal contemporaries which have accompanied the Sequoias at various times since their rise among the great dinosaurs and pterodactyls of the Jurassic. The Sequoias overtowered and survived the giant reptiles of the Cretaceous, the "dawn horse" and huge ungulates (Amblypoda and Titanotheres) of the Eocene, the *Brontotherium* of the Oligocene, and the rhinoceroses, saber-toothed tigers, and early primates of the Miocene. In the last-named period they reached their greatest geographical expansion. The fossil remains, especially the cones, of the Sequoias are exceptionally resistant, and so render a very complete geological record

The Ancestors of the Sequoias

TREES WHICH HAVE A HISTORY OF TEN MILLION YEARS, AND ARE TODAY PASSING INTO OBLIVION

By EDWARD W. BERRY

Professor of Palæontology, Johns Hopkins University

IN the days when the world was considered to be only about six thousand years old and when the few known fossils were considered to be the visible evidence of Noah's flood, it was scarcely remarkable that no one was interested in tree ancestors. In these days, however, with the passing of our virgin forests and the great interest taken in preserving some of our threatened species from extermination, it is a matter for surprise that the thought that these noble races of plants had ancestors is but rarely entertained.

Tree genealogies, it is true, present little of the dramatic as compared with the wonderful American evolutionary series of the horses or camels, and yet most of our familiar forest trees are of more ancient a lineage, and some, like the Sequoias, go back almost to the birth of the tiny progenitors of the warm-blooded animals. Although the book of the future is tightly sealed, that of the past needs but understanding wedded to imagination to be legible even though its torn pages are the rocks of the earth's crust.

The chapters of this book of history where the records of the Sequoia occur are those chapters from late Jurassic time down the ages to the present. The entries of the Sequoia ancestry comprise innumerable leaf-bearing twigs, many cones, fragments of wood, and occasionally, as in Yellowstone Park and at Florissant, Colorado, mighty silicified trunks petrified into forests of stone and buried by tremendous showers of volcanic ashes.

Sequoia remains resist decay admirably, so their chances of preservation as fossils in the rocks are much better than those of most plants. The cones, especially, are very common in the geological record, and a favorite method of preservation is as ferruginated mud casts. I have collected these from the Lower Cretaceous of Maryland, from the Upper Cretaceous of Kansas, and from the early Tertiary of Dakota. Cones almost identical with those of the existing redwood are abundant in the present arid Bad Lands of western Dakota, denoting very different climatic conditions in that region in past ages.

The earliest known Sequoias come from the late Jurassic. They first became widespread, however, during the later Mesozoic, radiating from their original home, which was probably in the Arctic archipelago, southward to western Europe and North America, and along the eastern coast of Asia. (See sketch map at the left, page 155.) Little is known of Asia at that time, but North American Cretaceous records are innumerable, extending from the Atlantic to the Pacific, and southward to southern Mexico, and there is one record from Argentina, which, if the identification is correct, means a migration from North America across the equatorial region and the origin of the Tertiary species found in Chile.

It is during the succeeding older Tertiary, however, that the Sequoias reached their widest limits of distribution. (See map at the right, page 155.) Europe and North America were fairly covered at one or another time during this period. Asia has furnished many records, and somewhat questionable

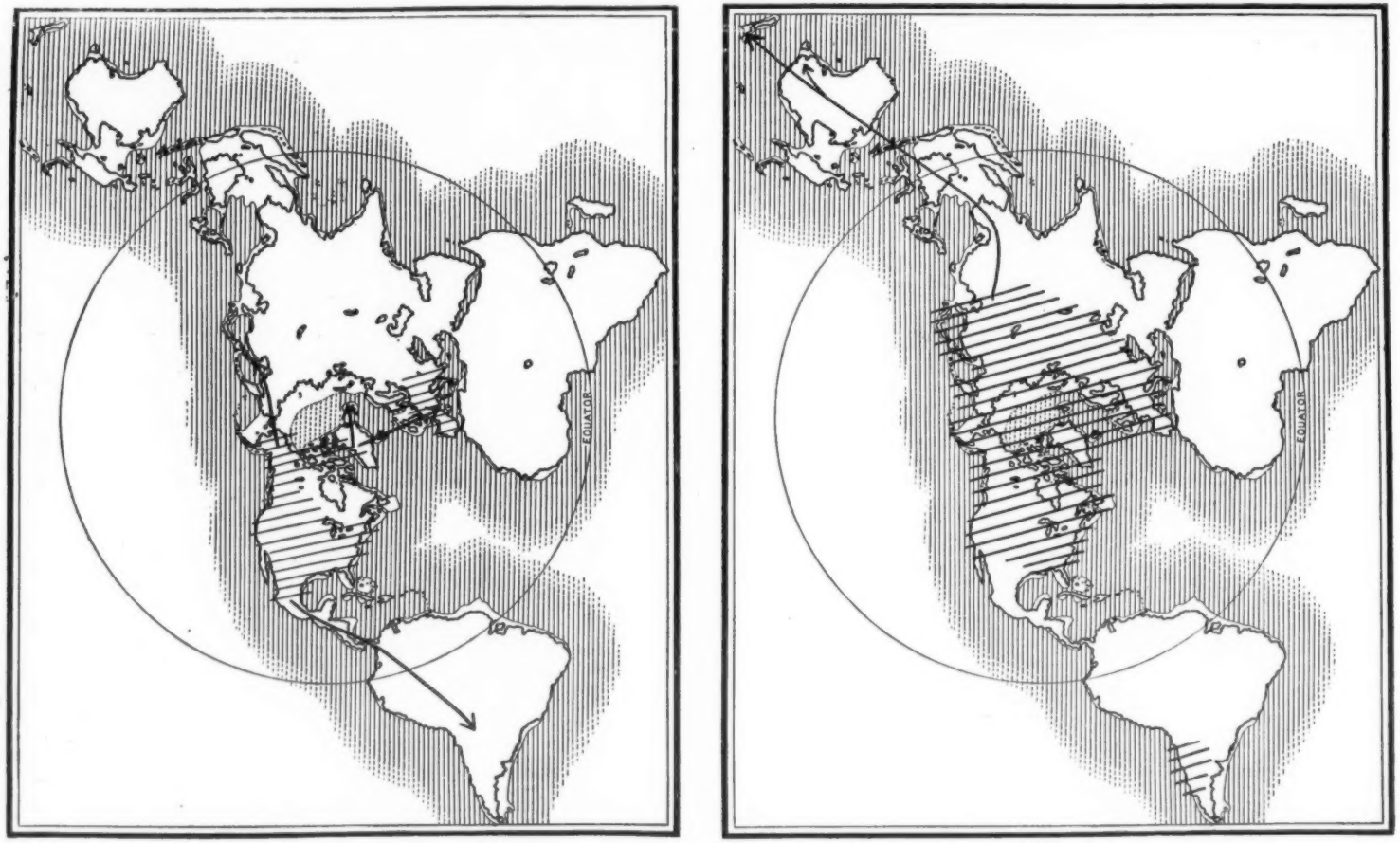
evidence points to the extension of the Sequoia range to Australia and New Zealand. No records for any period of Sequoia history have been furnished by southern Asia and Africa, and all of the known Tertiary records are outside of the tropics and almost exclusively in the North Temperate and Arctic zones, for Greenland, Iceland, and Spitsbergen were colonized, as well as Siberia, Alaska, and the Arctic coast of North America, during the older Tertiary. Sequoia twigs are common in the Tertiary coal measures of southern Chile, as I was at pains to verify during a recent visit to that most interesting region. They are found in Europe as late as the time immediately preceding the Glacial period.

Today the two existing survivors of this ancient race are our oldest trees; one might appropriately term them existing fossils. The accompanying figure shows the evolution of animal life witnessed by these ancestral Sequoias. It was printed fifteen years ago and is republished through the courtesy of the *Scientific Monthly* (formerly known as *Popular Science Monthly*). The picture owes its original existence to the creative art of Mr. Charles R. Knight and the liberality of Professor Henry Fairfield Osborn, and although our conceptions of some of the details of these restorations have changed somewhat with a better understanding, the drawing will still serve as a dramatic portrayal of the past. The millions of years during which Sequoias have flourished have seen striking changes in the animal kingdom, from the uncouth dinosaurs and flying reptiles of the Mesozoic through the evolving mammals of the Tertiary to the Age of Man.

Equally great, if less obvious, changes have taken place in the vegetable kingdom, for the first Sequoia lived amid a flora of ferns and cycads, and there were no representatives of the flowering plants—the mammals of the plant world—in those far off days. The flowering plants are the most specialized, the latest to appear, and the dominant existing race of plants—the race that made possible human civilization, since all of our food plants, upon which modern as well as primitive cultures rest, belong to this race.

I have said nothing of the majesty of this royal line of trees, nor of their individual size or longevity. It is a story that has often been told. The largest of the trees in the Sequoia National Park had already sprouted before the first Olympiad or before Carthage was founded, that is, in the days of the Judges in Palestine and the first flowering of the Assyrian Empire. The redwoods are somewhat more abundant than their brothers, the "big trees," less massive and shorter lived, but they are more like those fossil species whose structures have been investigated. Moreover, they are more accessibly located, more easily lumbered, as yet unprotected by law, and hence more in danger of total destruction.

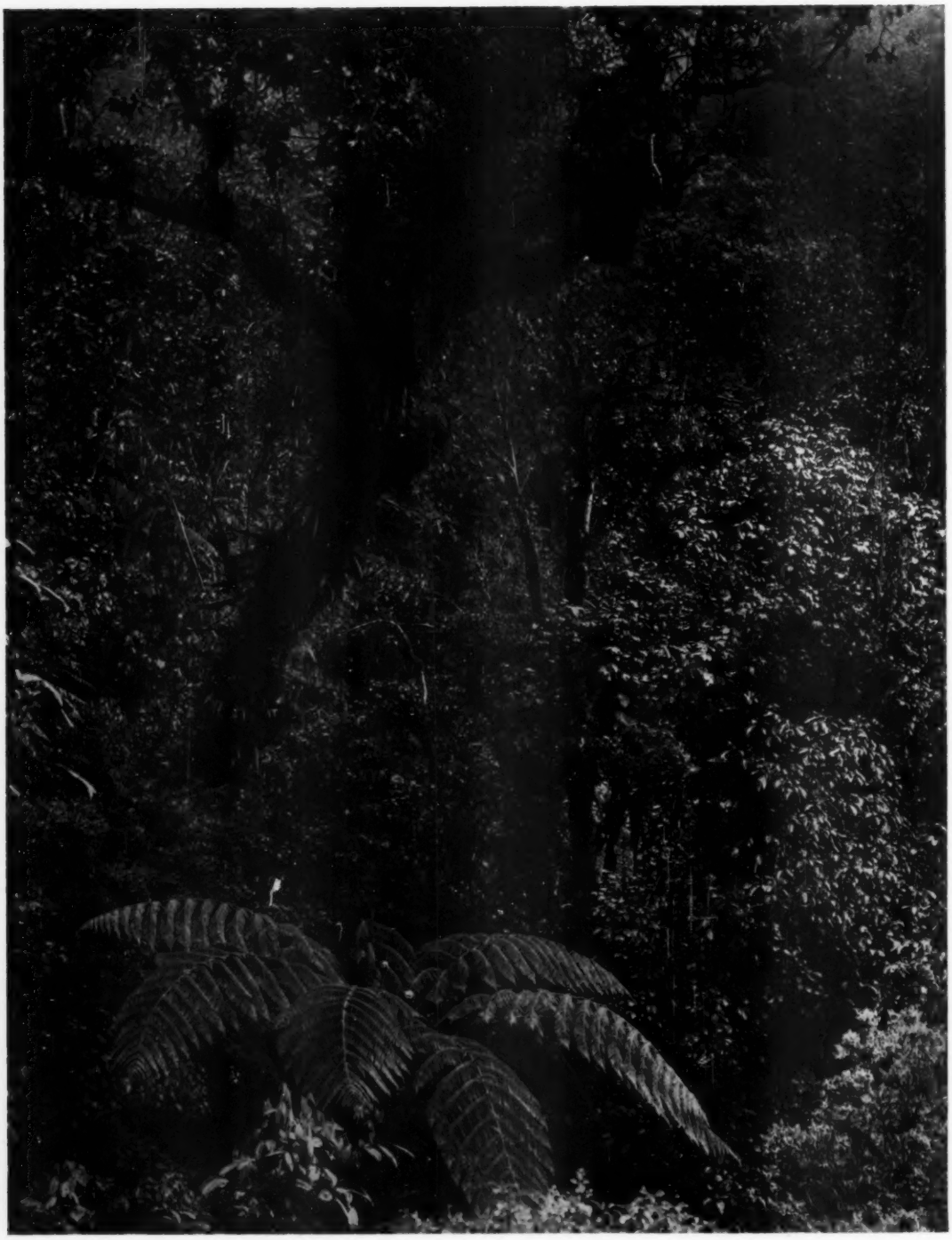
That we do not treasure the Sequoias or any of our forest trees sufficiently is a reflection upon our democracy. I sometimes wish that we moderns were less pragmatic and that our bump of reverence was less vestigial, for then not only the redwoods but all of our trees might become as sacred as they deserve to be, and even a lumber trust might hesitate to turn these abodes of the gods into waste places. Our forests, like the stars or the changing seasons, are wonders whose lessons and value have become dimmed because of long familiarity. If we saw them but once or twice in a lifetime they would be treasured accordingly. One has but to dwell in a treeless desert for months to have awakened within him such a love for the forests as will last forever.



MAXIMUM DISTRIBUTION OF SEQUOIAS

During Mesozoic Times, the Age of Reptiles (see map at the left), and during Cenozoic Times, the Age of Mammals (map at the right)

The two extant species of Sequoia, the big tree and the redwood, unique among trees for age and size, are the restricted survivors of a once widely distributed genus. Their dispersal began in the early period (Jurassic) of the previous geological era, the Mesozoic or Age of Reptiles, and during this age they probably radiated from the Arctic archipelago southward over western Europe, North America, and the eastern coast of Asia. Twigs, cones, and seeds were left abundantly among the Lower Cretaceous or Comanchean rocks. During the Tertiary period of the succeeding Cenozoic era or Age of Mammals, the Sequoias reached their maximum distribution over practically all of Europe and North America, a large part of Asia, and southern South America. *Sequoia langsdorfii*, the direct ancestor of the redwood, was predominant in the great circumpolar forests of the late Mesozoic, and *Sequoia magnifica*, almost identical with the redwood, left the petrified trunks found in Yellowstone Park and at Florissant, Colorado. During the cold Pleistocene which preceded our recent geological period, the Sequoias disappeared except in the Pacific coast area where they are still dominant



MOUNTAIN FOLIAGE ALWAYS DRENCHED IN MIST

The vegetation of the Blue Mountains of Jamaica, and to a certain extent of the John Crow Mountains as well, is very luxuriant and abounds in ferns and mosses. Heavy rains and mists which constantly sweep over the slopes induce a riotous growth. Epiphytic bromelias lodge on all the larger limbs of the forest trees, and fine trailing ferns seek a foothold on every tree trunk and on every bank

A Zoölogist in Jamaica[1]

By H. E. ANTHONY

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AT the time of Gosse, the English naturalist who summed up the knowledge on Jamaican zoölogy about the middle of the last century in that delightful classic, *A Naturalist's Sojourn in Jamaica*, the island of Jamaica could claim for its native mammalian fauna only two species, exclusive of bats. These were the so-called Indian cony (*Geocapromys brownii*) and a rice rat (*Oryzomys antillarum*). Since Gosse, various contributing agencies, among them the introduction of the mongoose, have wiped out completely the rice rat and brought to the verge of extinction the Indian cony. Such a state of affairs could scarcely be expected to attract a mammalogist to Jamaica, nevertheless the plans of the department of mammals of the American Museum of Natural History, as a part of a comprehensive scheme for West Indian research, called for an early reconnaissance of the island and disregarded the apparent poverty of the fauna, trusting rather to the predictions that could be made on the basis of past work in the Greater Antilles.

Exploration in past years on Cuba, Santo Domingo, and Porto Rico, as well as on the smaller island of Anguilla, had disclosed the presence of a fossil fauna much more numerous, varied, and interesting, as far as mammals are concerned, than the one that is living there today. On these islands the fossils were found in formations from the late Pleistocene into the early Recent epoch, and the animals must therefore have flourished and disappeared before the advent of any man into the West Indies. There are two exceptions, two rodents which lived long enough to be a food item on the menu of the Arawaks, but passed into oblivion together with the Indians at the coming of the Spaniards.

These mammals formed a strange assemblage of curious and ancient ancestries, most of them with their closest relatives to be found back in the Miocene formations of Patagonia; while one of them, a peculiar, long-snouted, insect-eating animal that lived both on Porto Rico and on Cuba, as far as fossil records show, lost its last relative back in the Eocene beds of North America, making this island survivor outlast his mainland kin a matter of 5,000,000 years or more. The greater part of these fossils are rodents and vary in size from ratlike forms, the size of the domestic house rat, to giant gnawers

[1] The illustrations are from photographs by the Author.

that far exceeded in size any living rodent and attained a weight of perhaps 150 pounds. The largest forms, as well as those most likely to appeal to the popular attention as something very distinct from any mammal to be found living today, are ground sloths, ungainly, heavy-limbed edentates, distantly related to the slow-moving sloths of the present day, and like them, feeding on vegetation. The largest of these ground sloths was as large an animal as the black bear, but it had smaller relatives about the size of a fox terrier. The smallest mammals to be found in this fossil complex are insectivores, and the Cuban representative was comparable in size to the meadow mouse.

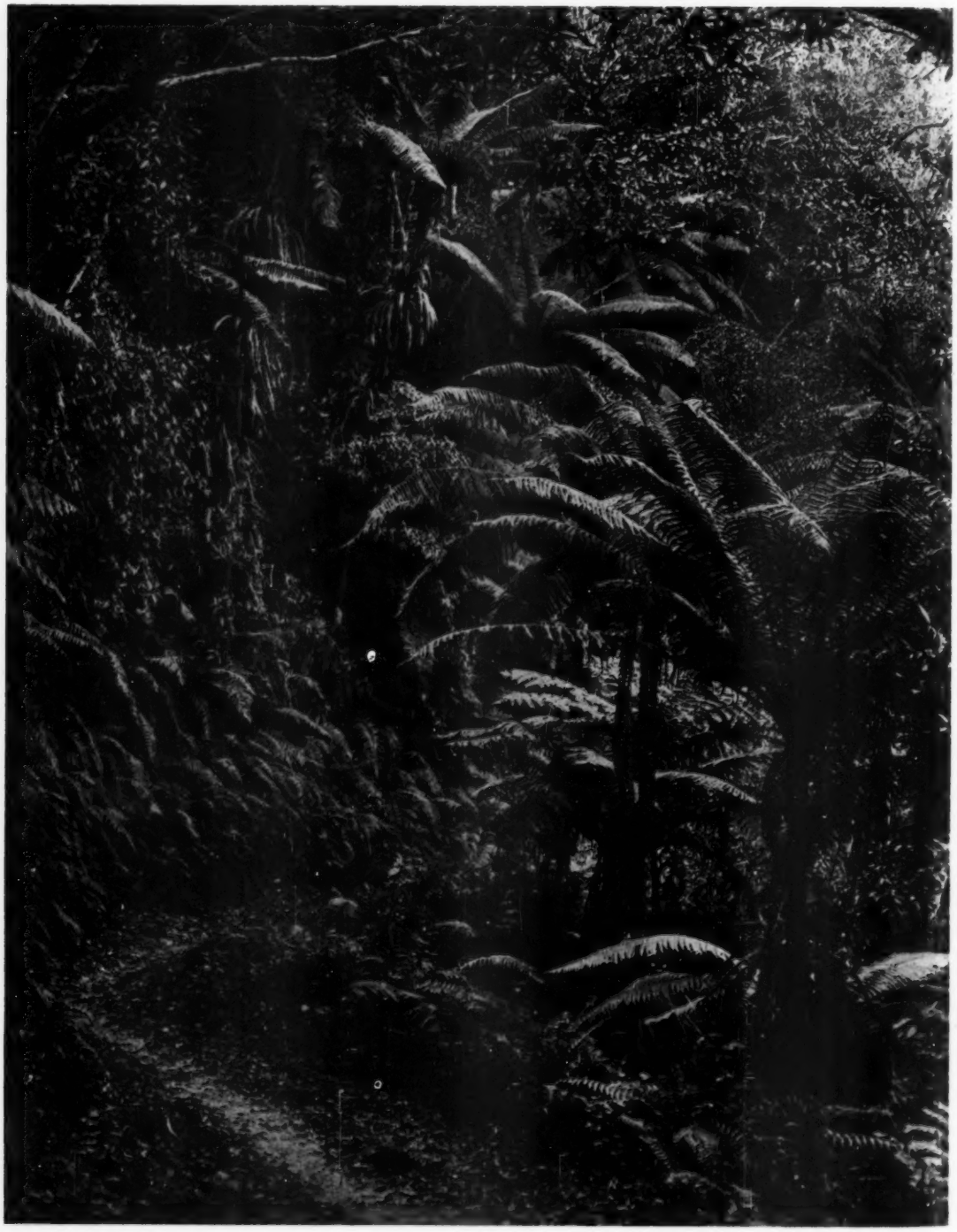
Although the first discoveries of fossil West Indian mammals were made in the latter half of the nineteenth century, the rapid extension of knowledge of this fauna did not come until about the time that the World War burst forth, and research in natural history gave way to the demands of the occasion. Unsuspected additions to the mammal inhabitants of Porto Rico, Santo Domingo, and Cuba at once aroused a dormant interest in the West Indies and exploration there received a vigorous impetus. The question of the arrival of these mammals on the various islands was explained by two different hypotheses. One school of investigators held that the islands must of necessity have been linked to the continental mainland at some time in the Tertiary, when the animals crossed dry-shod to take up what later became an insular abode. On the other hand, the antagonists of this theory maintained that the islands had no mainland connection in the Tertiary, but received their life through fortuitous methods of dispersal, chief among which were floating life rafts, great masses of caved-in bank, bearing vegetation and what not—such as yearly come down large rivers like the Orinoco and the Amazon and pass out to sea, carrying various forms of life that may have been trapped on them. The latter school held that the nature of the island fauna, so far as it was made up of mammals and such forms as were so restricted by quadrupedal locomotion as to need land connections for an extended distribution, argued against a land bridge because otherwise one should find more of the elements of a truly continental fauna. The discovery in recent years of so many new forms has in a measure added fuel to the controversy, for, while the number of forms has been increased greatly so that the life raft theory would seem to be overworked to account for them all, on the other hand the nature of the fauna has acquired a peculiar aspect, namely, that of an assemblage of rodents, insectivores, and edentates only, with none of the dominant mainland types from such groups as the ungulates, carnivores, and marsupials. One significant feature, however, that has been indicated by the discovery of closely related forms on adjacent islands, has been the gaining in favor of the hypothesis that all of the larger islands at one time in the Tertiary formed an Antillean continent of considerable extent. In this connection the island of Jamaica might well have been considered to hold the deciding evidence, since its possibilities had not been exploited and since its position, in relation to submarine topography, would bring it equally well into such an Antillean continent or into an eastward extension of the mainland from Honduras. The more than likely chance that new and interesting discoveries awaited the first mammalogists to make a detailed search for fossils led me to plan work on Jamaica as the first resumption of West Indian exploration after my return from military service.

With an assistant from the department of vertebrate palæontology of the American Museum, Mr. Charles Falkenbach, I left New York for Jamaica November 19, 1919, and spent four months in as thorough a reconnaissance as such a short period permitted. The results of the trip have been doubly satisfactory, first in the acquisition of new and valuable material for the Museum collections, and second in the vindication of the belief that the West Indian fauna has yet many treasures to be unearthed.

In the West Indies the main source of all the fossil finds has been the limestone caves. Because of the geological nature of the Greater Antilles, which have extensive areas wholly of limestone, caves are of frequent occurrence, and in times gone by the mammals have made use of these caves, either as a daily refuge in which to live, or, in the case of old or diseased individuals, as places into which to crawl and die. Finally a species of owl, closely related to the barn owl of the mainland, has made these caves its home, and as it preyed entirely upon birds, small mammals, and reptiles, the

BONES PRESERVED IN A CAVE 100,000 YEARS

The great fossil discoveries of the West Indies have come from limestone caves where many of the animals of past ages probably lived and where others crawled away to die. The American Museum Expedition examined about seventy caves. The richest in fossils was at Balaclava near the center of the island. Here were obtained large masses of a conglomerate, hard limestone formation, containing pebbles, shells, and bones (as shown in the photograph) which will be chiseled and worked out with great care in the Museum laboratories. There have already been discovered in it a new rodent of most unusual size, a large terrapin, and a crocodile. The evidence points to the Pleistocene as the time when these animals lived, and the bones have been held in the limestone 100,000 years



IN HIGH ALTITUDES OF JAMAICA

The most conspicuous and the most beautiful feature of the environment in the higher parts of the mountains is the tree fern. Many species are known from Jamaica, and all are noteworthy for their clean-cut appearance, which makes them stand out sharply against the jungle background, and also for the vigorous green of their foliage

pellets cast up cover the cave floor in some cases with millions of small bones, and have been the source of a great deal of material which could have been obtained by no other means. Accordingly the island was mapped out first in respect to the limestone areas, and trips were made into all of the most promising cave regions. We found that many caves must be visited in order to strike upon one that proved to have been so situated that it attracted the sought-for inhabitants; thus in all, about seventy caves were examined. As luck would have it, the richest cave of the entire trip was located at the very first station visited, Balaclava, a little west of the center of Jamaica, in the parish of St. Elizabeth.

Here was encountered, in a very small cave at the base of a limestone cliff, a breccia or conglomerate formation made up of earth, pebbles, and bones, all cemented into limestone by the action of water charged with lime, and a mass of valuable material was obtained. The most important mammal found in this formation was a rodent. If one may judge from the limb bones associated with and apparently belonging to the typically rodent teeth (which alone of all the material is at present sufficiently free of the matrix to allow of examination), this animal possessed a huge, disproportionate body structure, larger than any living rodent, and indeed surpassed in this respect by few rodents of any time. Until the material has been worked out of the concealing limestone in which it was collected, nothing but conjecture as to its form and relationships may be indulged in, but of its distinctness there can be no doubt. Associated with this large rodent were found a terrapin, larger considerably than the one living on the island today, probably a large tortoise, and fragments of a crocodile. This breccia was found cemented to the side and to the ceiling of the cave, and its position, taken in conjunction with other evidence, points toward the time of its formation as being in the Pleistocene, probably a matter of 100,000 years ago.

A like formation was encountered at one other locality on the island, and here also the evidence of antiquity was very strong. Throughout most of the island the caves were of too recent formation to contain such old deposits. For example, along the seacoast, where the last elevation of the island brought the coastal plains up out of the sea, although the caves were numerous they were invariably of quite recent formation and contained none of the interesting new fossils. The latter caves often did yield, however, remains of the extinct rice rat, thus showing that at no very remote period this small rodent had a widespread distribution and was so common that it formed an important part of the diet of the barn owl. The reason for its disappearance obviously lies in the advent of the ubiquitous Norway rat and the bloodthirsty mongoose, but the cause of the disappearance of the older, Pleistocene mammalia is not so apparent.

In numerous localities the records of the former Indian inhabitants were found.

The species known as the Jamaica barn owl has inhabited certain caves on the island for thousands upon thousands of years. This owl swallows its prey whole—mice, small birds, frogs, and lizards—and ejects from its stomach large pellets of the undigested fur, feathers, and bones. These pellets line the cave floors to the depth of a foot or more, often weighing many tons in the aggregate, and serve as a volume of natural history to the investigator, and an invaluable record of the changing animal life of Jamaica

These Indians, the Arawaks, were an agricultural people, of peaceful disposition but continually harassed by the cannibalistic Caribs who frequently descended upon them from the sea, and who had in fact driven them from the South American mainland to seek a refuge on the islands. Because of their fear of the Caribs it would appear that the Arawaks kept a lookout seaward from the well-concealed caves to be found in many places along the coast. Also it was their practice to bury their dead in caves, and in our excavations it was a common occurrence to turn up human bones. Sometimes, if the cave was an ample one, charcoal and bits of pottery showed that these primitive people had feasted in the caves, either at a time when they were hiding from the enemy Caribs or possibly as a funeral rite. Always to be found in these ashes were the bones of the rodent *Geocapromys*, and it is from this fact, I was told, that the animal gained the name of Indian cony. It is the one native land mammal living on the island today, bats excepted, and until about 1900 it had an extensive distribution and was a favorite food item with the Negroes.

Because it has been preyed upon by the mongoose and also constantly hunted, it has been gradually killed off, and at the time of my arrival upon the island I fully expected to learn that it was extinct. At the Institute of Jamaica, in Kingston, however, I found a live one in captivity and was told by Mr. Frank Cundall, the librarian in charge of the Institute, that the species was still to be found in the John Crow Mountains, on the eastern end of the island. I therefore planned a side trip into these mountains to obtain a few specimens for scientific work in the American Museum. Through the courtesy of the United Fruit Company we were enabled to spend about ten days on their large plantation at Windsor, near Port Antonio, and about nine miles from the heart of the John Crow Mountains.

The Indian cony is a robust rodent, with a body the size of that of an ordinary house cat, but with a very short tail. It is almost exclusively nocturnal. The local name given to it by the Maroons, those Negroes who live in the Jamaican hinterland and claim descent from the runaway Indian and Negro slaves of centuries gone by, is "grazee," having reference to its habits of feeding on grasses and the leaves of low shrubs. It seeks shelter for the day under the roots of some large tree or far back under huge limestone bowlders, and is found at present only in the roughest situations. We learned that to obtain any specimens and to observe anything of the animal in life it would be necessary to climb up into the fastnesses of the mountains and spend a night or two "in the bush" while we hunted the cony with dogs. A local magistrate, Mr. Massey, kindly made the necessary arrangements for a hunt, and with five men and numerous small dogs we started for the upper John Crow Mountains. After a long climb up slippery trails we at last came to an opening in the forest where a palm-thatched shelter had been erected for the convenience of hunting parties. It was early afternoon, and there was yet time for some hunting, so we left certain of the men to dispose of the packs, build a fire, and put the shelter in readiness for the night, and with six small dogs struck off into the forest.

We were at about 1200 feet elevation on the western slope of the mountains, and although the forest was fairly thick it was yet possible for one to leave the trail and work his way through the "bush." The dogs disappeared almost before we were out of sight of camp, some of them going on up the trail ahead and others taking off into the brush at either side of the trail. It was an overcast day, and it had rained several times while we were coming up into the mountains and now, under cover of the primitive forest, it was very dark and gloomy and there were no bird calls to break the stillness. Before we had gone very far the two natives stopped and loaded their single-barreled shot-guns, first inserting a shell loaded with number six shot, and then dropping down the muzzle a heavy slug of lead which they held in place over the shot by ramming down a wad of paper or leaves. I learned that this was in preparation for wild hogs, which were likely to prove disagreeable customers if they were encountered at close quarters on the trail. The mountains of Jamaica in the wilder, more remote sections, are the haunt of a great many of these feral swine whose ancestors escaped from domestication more than a century ago. The boars grow large tusks and show an inclination to use them, so the natives pay this animal considerable respect.

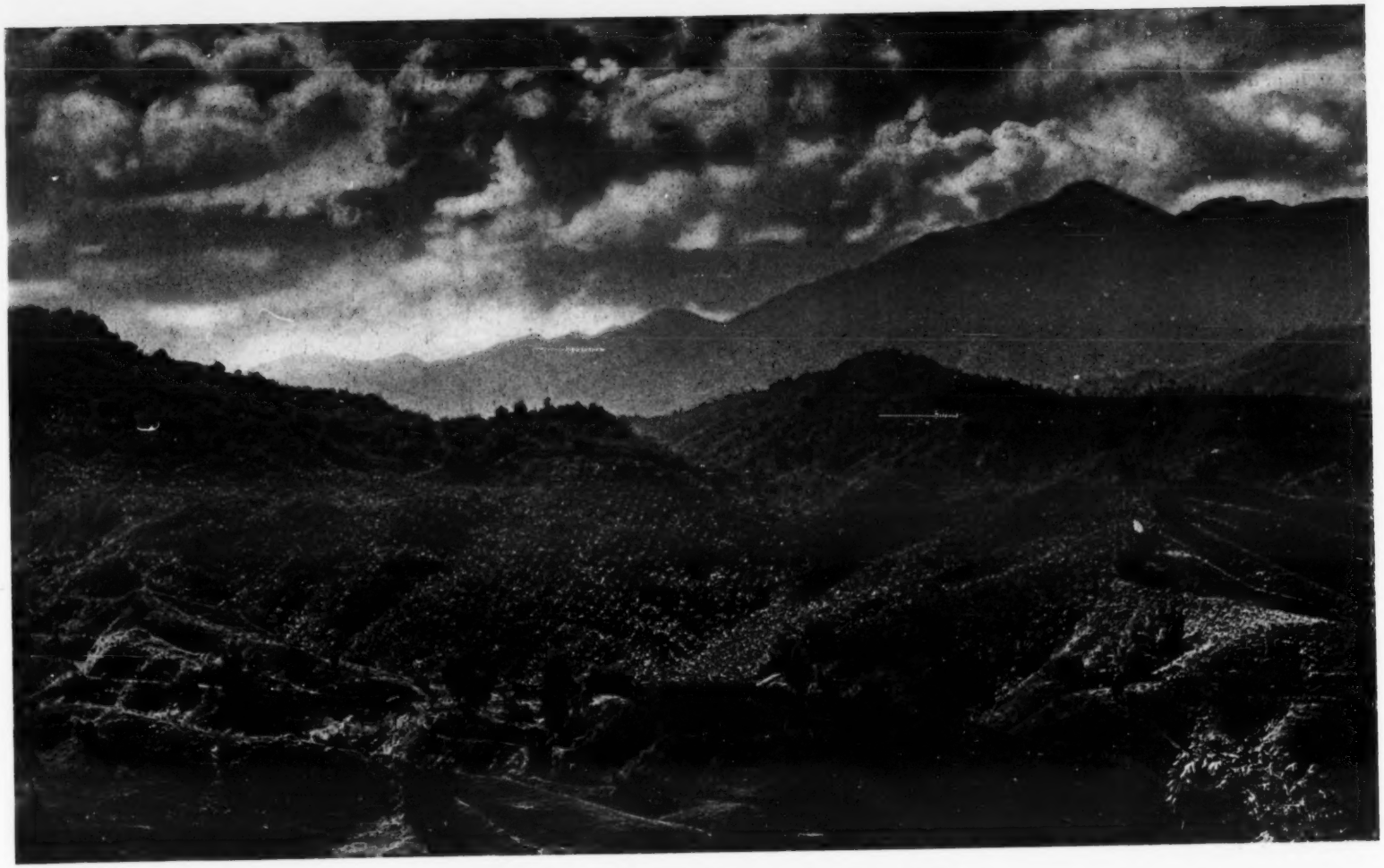
As we were crossing a small stream, one

of the dogs that happened to be following at heel made a sharp swerve to the right and began a diligent search among some bowlders and old logs. His actions had been noted and we waited to see the outcome. Very shortly he set up a wild, excited yelping and began to dig away in a frenzied manner at a large hole that ran back under a huge bowlder. The Negro hunter with us became almost as excited as the dog, and ran back across the stream to help dig out the cony. With his machete he soon cleared away the fallen vegetation, and when the hole was sufficiently exposed he was able to pull out a few fragments of limestone that blocked up the entrance and this allowed the dog to get his head and shoulders inside. The dog had been impatiently waiting for this to be done, and as soon as the man's hands were withdrawn, he plunged into the hole and by dint of much struggling was able to worm himself in until only his tail protruded. Then we heard a faint birdlike chirping in the intervals when the dog drew breath for a fresh outburst of barking, telling that the dog and the cony were face to face, and almost immediately the sound of snarling and worrying. When the hunter heard this, he reached in and seized the dog by the hind leg, dragging him out by sheer strength.

The dog had secured a firm grip so that the cony was dragged out into the open, where it was promptly seized by the hunter before the dog could tear it. The cony possesses sufficient vitality to withstand a great deal of mauling, and can put up a good fight. This one had bitten a small piece out of the dog's nose. Not infrequently several animals are taken from the one hole, and we put the dog back to see if he could find any more, but he soon backed out with the disgusted expression that showed that the place had no further interest for him, so we moved on. In this case the dog was of rather good size for this type of hunting; generally speaking, the smaller the dog, the more it is prized by the Negroes, because it can enter the holes more easily.

Less than a hundred feet down the stream one of the other dogs now gave tongue to a shrill yelping, and dogs and men went pell-mell to give assistance. This hole was a much more difficult proposition than the other, and I did not see how there could be any hope of enlarging it, as it ran under huge blocks of limestone weighing tons. The dogs, only three of which were with us at this moment, were indulging in the wildest antics at the entrance, scratching frantically and lying on their sides in the effort to take up as little room as possible and squeeze into the cavity. From this great display of

The Indian cony (*Geocapromys brownii*) is a heavy-set little rodent with coarse, reddish brown fur of no commercial value. The natives are fond of cony flesh, and roast the singed animal whole much as if it were a small pig. The particular cony of the photograph was snared at the mouth of its burrow by a native who had learned that there was a temporary market for live conies while the American Museum Expedition was in the neighborhood



A BANANA PLANTATION ON THE MOUNTAIN-SIDE

Thousands of acres of land in Jamaica are devoted to the cultivation of bananas. The orderly rows of plants extend even into the mountains, for the soil there is very fertile and the rainfall heavy. This photograph was taken in the Blue Mountains on one of the holdings of the United Fruit Company at Windsor, where the members of the expedition were entertained. The Blue Mountains rise above the valley to a maximum height of 7300 feet. Great masses of puffy white clouds are always drifting along the mountain slopes, and it is seldom that any extensive area of blue sky may be seen

A HUNTING PARTY WITH CONY DOGS

The Negroes are enthusiastic hunters in the John Crow Mountains, and stop at nothing to capture a cony when it has been located. The dogs—poor, half-starved mongrels for the most part, whose ribs stand out with pitiful distinctness—show an unbelievable intelligence in pursuing the game, and are adept at worming into a small burrow. The tall staff held by one of the men is a sharp spear for wild hogs which are sometimes encountered on the trail. The photograph shows in the background a mountain shelter built for the use of hunting parties

eagerness the two hunters concluded that the cony must be very near the entrance and consequently should be easily reached. Digging with a machete loosened some of the rock and earth at the entrance, and then a large bowlder was encountered that seemed to defy further progress. Also one of the dogs had squeezed through, and was crowding against the bowlder with such impetuosity that it seemed certain he would try to dash past if it were loosened by hand, and would be crushed by its weight. However, the men would allow nothing to stand between them and their quarry and the two of them crawled halfway under the big overhanging limestone bowlders, and while one held the obstructing bowlder from crushing the dog, the other loosened it and rolled it out of the way. That was the conclusion of the chapter. There was the same procedure of dragging out the dog and taking the rodent away, and we had secured two specimens of the Indian cony for our first hunt.

The next morning dawned in the midst of heavy showers, and it was ten o'clock before we could take the trail. Mr. Falkenbach stayed at the camp to get the packs in readiness for our return that afternoon while I took three of the natives for another try at the conies. Soon a chorus of barkings and yelping from several dogs made us think that the pack had run across wild hogs, and the hunters forthwith scattered out to command the several trails in that immediate neighborhood, but when the commotion seemed to be stationary it was concluded that the animals were barking at a cony hole. Abruptly the chorus was changed to angry snarls and yelps of pain, and the hunters called out that the dogs had caught a cony and were fighting over it among themselves. We hurried to the spot, but we were too late. Only a torn up bit of forest floor showed where the fight over the feast had taken place. When we arrived on the scene the dogs were all back at the hole, which was under the base of a huge tree that sent out wide-spreading roots.

One of the dogs had crawled so far under these roots that his barking was muffled and barely audible, and his presence could only be guessed at, since no part of him was visible. Another dog had entered under a different root and was threatening invasion from a new angle, but had not been able to get so far. A third dog stood outside, near a very small burrow that ran up the axis of a root, and after barking a few moments until his worked-up emotions could not be restrained any longer, he would reach down and bite long splinters out of the root and then thrust his snout into the opening to draw long, audible sniffs of the quarry-tainted air. Still other dogs ran aimlessly about the tree, barking or trying to shoulder one another away from advantageous spots.

It was only after an hour and a half of digging by four men and six dogs, that the cony was reached by means of a bit of strategy. The rodent had been located approximately by the action of the dogs, and occasionally its chirping call note could be heard. Two particular dogs were called into service and the others were forcibly kept in the background. The hunters loosened the earth and enlarged the hole as much as possible and put in the larger and stronger dog. With one long, ecstatic sniff for location the canine pushed vigorously in as far as the space permitted, and then lying over on one side scratched loose and dug out considerable amounts of soil. After he had dug thus for a while he was drawn out and the smaller dog, called Fanny, was allowed to enter. She got so close to the cony that her excited yelping threw the dogs outside into the greatest excitement. The quarry, however, seemed to be able to keep just out of reach, although obviously its line of retreat was rather restricted. The old Maroon had been digging in from the side above where the cony seemed to be located, and suddenly he called out that he had touched the animal. About that time Fanny came to grips with a very angry cony that proved to be more than a match for the little dog. Amidst snarling and chirping, and an accompaniment of great anxiety on the part of the outside dogs, which had all been tied on leashes and were being held, Fanny tried to back out of the hole with the cony, but he broke away and disappeared.

Each man was now anxious that his own individual dog should be put in to finish the job, but the unquestioned leader of the pack, Captain, was finally set free. There was an energetic scuffle inside and as soon as one of the men could catch a leg of the dog he was dragged out, and this time the cony did not escape. The entire proceeding had been exciting from the very

MARKET PLACE AT A CROSSING OF MOUNTAIN TRAILS

Market day in the Blue Mountains near Cinchona is a popular event in spite of the difficulties in transporting produce to an elevation of 5000 feet. There are spread out for sale all sorts of ground provisions, such as yams, yampes, cassava, sweet potatoes, cocos, and cho-chos, together with fruits—bananas, plantains, oranges, and grapefruit—and a few chickens and eggs. Most of the commodities are carried up the mountain on the heads of the natives, although some are transported in hampers loaded on the backs of donkeys

start, well worthy of some larger game, and the energy and intelligence displayed by the dogs were out of all keeping with their appearance, for they looked to be worthless, half-starved mongrels.

Another collecting trip was that made into the Blue Mountains, when a week was spent at Cinchona, at an elevation of five thousand feet above sea level. It would be difficult to find scenery more beautiful than that visible from the summits of the Blue Mountains. Here, however, scarcely any material was obtained, and the evidence collected was all negative since nothing but the introduced species, the house rat and the mongoose, are found there. Traps were set to confirm this supposition and caught no native mammal.

Only too evident were the ravages of the mongoose seen in the disappearance and approaching extinction of many forms. The mongoose was introduced in 1872, in order to keep down the rats which had been a great menace to all crops. It was not brought to Jamaica to kill off the snakes, as many people seem to think, for no venomous snakes have ever been found in Jamaica. At first the mongoose proved a great success, rapidly thinning out the rats until the rats learned that the only safety for them was in an arboreal habitat, and they became tree dwelling. The mongoose does not climb, and consequently the rats soon became as numerous as before, and a greater pest than ever since they were up in the trees and not so easily destroyed. A new phase of the disturbed cycle of Jamaican life now was manifest. The mongoose, deprived of a rat diet, turned upon all the other small forms of animal life with an even greater intensity, and soon made great inroads upon the ground-nesting birds and upon the lizards, frogs, and toads. These animals had been contributory to the keeping down of numbers of the cattle ticks, and with their diminution the ticks began to increase at an alarming rate. It is said that the mongoose was susceptible to the ticks and suffered greatly in consequence; at any rate the animal died off in great numbers and for many years was just able to hold its own. Now, however, its numbers have increased until it is no uncommon thing to see three and four daily, and they range from the seacoast to the very summit of Blue Mountain Peak.

Collections of reptiles and birds were made, although these were necessarily small for lack of time to cover all the branches of vertebrate zoölogy. An iguana (*Cyclura*), the largest lizard known on the island, was especially desired since this is one of the animals that have disappeared with the introduction of the mongoose. It is now known only on Goat Island, a small island in Old Harbour just off the main island and to which the mongoose has not yet penetrated. Two trips were made to Goat Island, and on the second attempt an iguana was obtained.

The people of Jamaica are greatly interested in all that pertains to their island, and any effort to increase the knowledge of the early history of Jamaica meets with a ready coöperation. Members of the American Museum Expedition met with a helpful interest everywhere, and no small part of any success achieved is owing to the generous assistance of the residents.

The interest in West Indian zoölogy has been growing yearly, and more and more attention is being directed toward the solution of the several big problems connected with the study of this subject. The accumulation of evidence is growing apace, and among the fascinations of such a trip as the one to Jamaica is the possibility that some constructive advance may be made. For who can tell what the storehouse of fossil treasures may yield?

Rock Rivers

By VERNON BAILEY

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WE are familiar with the terms "rock slide," "slide rock," and "talus" applied to the masses of broken rocks which lie on the steep slopes of the mountain-sides, usually below some peak or cliff from which they have fallen; but such names seem inadequate for the more extensive and active of these moving masses. "Rock rivers" and "rock glaciers" they have been called.

Sometimes the rocks are fragments thrown from the mouths of craters and left sliding down the steep outer slopes; frequently they have been broken by various forces from the face of a cliff or high peak; again, they have been washed over a precipice by water or pushed over by ice. Usually they are the slow accumulations of broken rocks on steep slopes, or they are piled so high against the mountain wall that they have steep outer slopes of their own. Their form and action can be shown with a handful of pebbles or sand.

Rock slides, we say, lie at the angle of stability, which means that they would have visible motion if the angle were any greater. The angle of stability varies considerably with the size and nature of the rocks and the character of the surface on which they lie. Some that I have measured with a clinometer registered from 26 to 36 degrees above the horizontal, but at this angle there is no real stability.

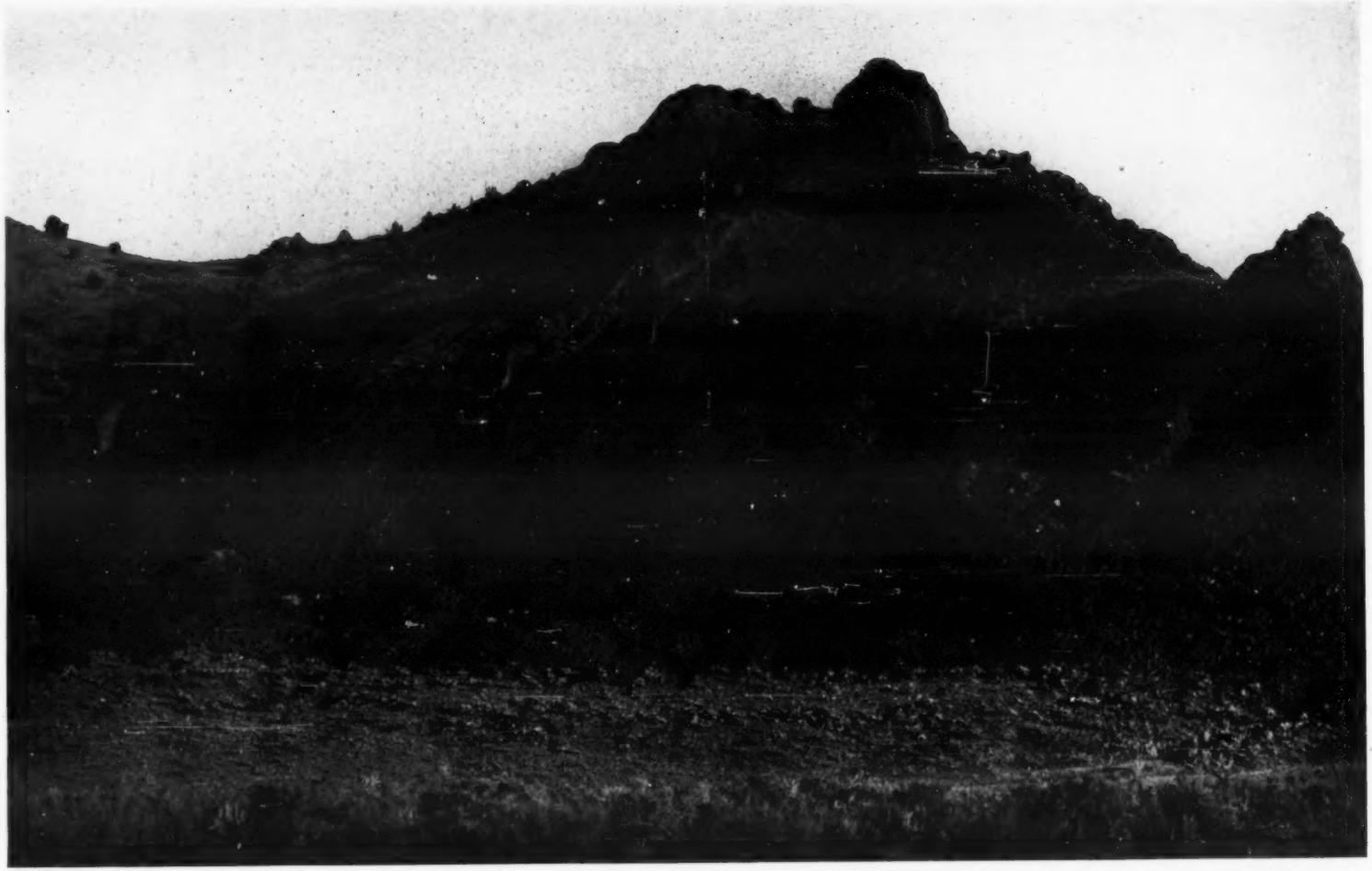
On one little volcanic cone near San Francisco Mountain in Arizona I climbed laboriously for more than two hours to reach the crater rim only 1000 feet above me, and came down again in about ten minutes by taking fifteen-foot strides in the loose scoria that slid with me all the way to the bottom.

On the sides of Mount Shasta there are many sliding slopes of fine, loose rock where ascent is difficult and descent rapid and easy; also many extensive slopes of heavier slide rock where ascent is easier and descent slower, because the weight of a person is not sufficient to set the mass in rapid motion. Still there is motion, constant or intermittent, often with many of the accompanying phenomena of a stream.

In form these streams generally resemble glaciers more than rivers, starting from a definite source and reaching down, fanlike, over broad, steep slopes for a few hundred or a few thousand feet, or sometimes for a mile or more. A broad slope may carry many such streams of rocks from different sources, which join and blend into one great mass that widens below until checked by striking another slope or by reaching a lower angle.

One such slope photographed near Riverside in eastern Oregon is composed of broken blocks of basalt from an old volcanic neck which rises 700 feet above the

Illustrations from photographs by the Author.



SLOWLY MOVING RIVERS OF BROKEN ROCKS

A broad slope down which flow many streams of broken rocks, from a basaltic butte in eastern Oregon. Tongues and islands of sagebrush cling here and there and at the base a ridge of soil and sagebrush is pushed up where the rocks bury themselves in the ground

THREE VIEWS OF ROCK STREAMS

Side view (at the left) of a broad expanse of sliding rock below the cliff of a lava butte in eastern Oregon, showing moderate steepness of slope.

A detail (photograph in the middle) of sliding slope, showing ripples below the points of rock that stand above the surface of the stream.

Head of the Kiger Gorge (at the right) in the Steens Mountains of eastern Oregon, a wonderful cirque, eaten out by glacial ice on a northeast slope at about 9000 feet elevation, now a sliding mass of talus below the base of the cliff

valley bottom. On this slope are seven well-defined channels which partly join and reach the bottom in three main rivers. Each of these streams shows some trace of curves, deep pools, shallows, rapids, and islands, and some show cascades or falls. A striking evidence of activity in one of these streams is the terminal wave where the rocks plunge into the mellow soil with such force as to push up a ridge of sagebrush-covered earth often twenty feet high, suggesting the last ripple of a stream meeting the ocean tide.

In rate of flow these rock rivers are probably slower than the ice rivers, or glaciers, but I am not aware that their speed has ever been measured. They must vary greatly with the angle of slope, the depth, the nature of the material, and the disturbing elements. Although they move with great force, under enormous pressure, the motion may be only an inch, a foot, or a rod a year; or from a sudden upheaval they may rush from source to terminus in a few moments.

After climbing over hundreds of these sliding slopes in the Rocky Mountains, Sierra Nevada, Cascades, and, best of all, in the desert ranges of the Great Basin region, I heard with keen interest John Muir's interpretation of their origin and dynamics. This was on a pack trip in the Sierra Nevada in 1900, when he often discussed mountain structure with us around the camp fires and along the trails. An earthquake witnessed in the Yosemite Valley when showers of rocks thrown from peaks and cliffs went thundering to the valleys below had solved for him the problem he had been studying—the origin of the Sierra talus.

One of the main interests in these rivers is the force producing them. There is always a source, generally a peak or cliff or ledge high up, from which the rocks keep slowly breaking away and falling, rolling, or sliding down to add their arrested momentum and force of gravity as they increase the surface angle of the stream. The forces which break off and start the rocks are many beside earthquakes and volcanic eruptions. Heat, frost, ice, snow, water, wind, thunder, and lightning are among the disturbing elements. The forces that keep them from remaining where they fall are all of these and many more. Heat swells and cold contracts them, the vibrations of the thunderstorm pass through them, rain loosens their props, snow presses them down, ice lifts some and pushes others aside, rain and hail pelt and tilt them, mountain sheep, goats, marmots, and chipmunks run over the surface and rock and roll them, and every change, every motion, however minute, is down, down, down, under the resistless force of gravitation. The weight of millions of tons pressing downward in a single stream of rocks is the great moving force, just as it is in a stream of ice or a stream of water. Put your ear to the surface of the rocks on a hot day. You can hear them creak and groan and sigh—the faint, low roar of a mighty torrent. When the earthquake shakes them and they go rushing and roaring downward, this is the flood time of the rivers of rocks.

The animal life of these streams is also of interest. Mountain sheep and goats make trails across them; rock conies find safe homes in the innumerable cavities under the surface and stack their hay for winter food under the shelter of the rocks; woodchucks and, in the north, great hoary marmots dive under the rocks to escape their enemies; chipmunks scamper over the rough surface or dodge underneath for safety; wood rats, white-footed mice, and many others of the small rodent tribe find safe retreats in their depths; rock wrens are often found bobbing and singing on the rocks; and high above timber line the rosy finches build their nests well back in the protecting niches under the rough slopes. To many of the feeble wild folk they are a wall of protection.

Plant life is scattered and scant except for mosses in the shaded nooks and lichens over the exposed surfaces of the rocks. These minute, scalelike plants usually cover the exposed surfaces of rocks that have remained quiet for a long time, but gain only a slight hold on those freshly broken from the cliff or those occasionally moved or turned over. So slowly do these plants grow that, as Muir has pointed out, they form a general index to the time a rock has lain in one position up to probably fifty or a hundred years. To a certain extent the speed of the rivers may be judged by these plants; the rocks of the steeper, more active slopes show fewer rock lichens, while those of the lower, quieter slopes are more heavily covered with these humble but by no means insignificant plants.

New Plans in Nature Extension Work[1]

By GEORGE H. SHERWOOD

Curator of Public Education in the American Museum of Natural History

THE American Museum carries on explorations in many countries, far and near. Its explorers study these lands, their people, and their native plant and animal life both of today and of the millions of years past. Then it displays freely in great exhibition halls all that it has discovered, so that everyone may see and know.

It has tried from the beginning of its history to make itself, here in the great eastern metropolis of America, a fountainhead of knowledge of the earth and the sea, and of man and all the other forms of life which have evolved on the earth. The doors are open every day in the year; there are guides and instructors for the exhibits, and lectures for all—even for the blind; there are great mural paintings of ceremonies and industries of ancient peoples; homes of animals are represented with such exact reproductions of nature that flower and tree and bird seem living; there are motion pictures of hunting and adventure, games and homes, work and play, in foreign lands. And the people of New York come to see all these things, and the children come in whole schools or classes, or voluntarily in small groups with their school-books under their arms or their roller skates swinging from their shoulders. The record has reached nearly a million annually for several years.

But the American Museum is always asking how it can do more to bring its wealth of original knowledge to the people. There are many in all ranks whose lives might be enriched in some way—made happier, gentler in nature, less self-centered, more resourceful, more valuable in their community—even more prosperous, perhaps, we can add, in these days of correlated science and industry. Especially would the American

[1] HISTORICAL NOTE.—There has just come from the press of the American Museum of Natural History, in the series of its Miscellaneous Publications, a small book, *Free Nature Education*, by Mr. George H. Sherwood. This is a report which gives the present status of the Museum's instruction to the teachers and children of the New York public schools in the Museum building, located in what is now about the heart of New York City, and also tells the story of the extension of the institution's teaching and resources out into the schools.

The staff of lecturers for 1919 included, besides the members of the regular department staff, men of experience in exploration, as Dr. E. O. Hovey, of Arctic interests, Mr. N. C. Nelson, especially known for his excavations of ancient ruins of the Southwest, and Mr. James P. Chapin, who spent seven years in the field and jungle of the Belgian Congo.

The history of the pioneer work in nature education by the American Museum is divided into two periods, in the first of which (1869–1904) lectures to adults were given at the Museum and a few small collections were deposited in the public schools; and in the second (1904–1919) a system of lectures to children was inaugurated, of guide service to the exhibits, of special instruction to the blind, and most important, a system of circulating loan nature study collections and loan sets of stereopticon slides. Today many advances force themselves upon attention and the work is entering a third period of very great educational activity.

There is much coöperation with industrial art, especially through the Museum's department of anthropology. This means affiliation with the work of such institutions as Teachers College, Hunter College, Cooper Union, New York School of Fine and Applied Arts, Ethical Culture School, School of Applied Design for Women, and Pratt Institute. Special rooms are set aside for the use of designers. There are rooms also made available for the public school teachers and their classes with equipment of blackboard and stereopticon. The work with the blind especially has reached a high development. There are regular classes for about one hundred fifty blind children, and the Museum is in touch with about seven hundred adult blind who are reached through special lectures. Among the lecturers have been such men as Sir Arthur Pearson, of England, and the late Admiral Robert E. Peary.

In reporting on the extension work of the Museum in its newly inaugurated plan for Local Lecture Centers, Mr. Sherwood emphasizes the need for larger collections in the selected schools:

"Our present circulating collections are doing important work, but more effective results would be obtained if the teachers might have available a more extensive teaching collection. For this reason it would seem desirable to establish a Branch Teaching Museum in a number of centrally located schools. The teachers of the district could then draw upon this material as required. The material could be changed periodically, perhaps three or four times a year, corresponding to changes in the course of study. The Branch Teaching Museum should contain not only representative specimens of the animals that are being studied but small portable groups illustrating relations to environment."

The following statistics of the report are of interest:

The number of schools in Greater New York supplied in 1919 with circulating collections were 385, reaching nearly 900,000 pupils. The lectures to school children given during 1919 number 90, with a total attendance of about 50,000. The separate loans of slides number 1470, including a total of 80,000—THE EDITOR.

Museum spread the knowledge and happiness of nature before the million children of Greater New York, whose thoughts are continually cramped and warped by their more or less sordid surroundings into channels not healthful or idealistic for youth.

To attain this greater breadth of result three new plans of Museum extension are in mind in definite form, two already initiated and the third in immediate prospect. All are methods, of course, of taking the Museum's work to other centers of dispersal than the Museum building on 77th Street and Central Park West. We must now carry nature to the children instead of depending entirely on their visits to the Museum, which have become increasingly difficult with the great growth of the city and the complexities and expense of transportation over the long distances.

The first new plan concerns the establishment of various schools as Local Centers, situated within easy reach of given other schools, so that the children can walk the intervening distance. At these centers American Museum study collections will be kept permanently, and distributed as traveling collections to the teachers of the surrounding schools. Also the chosen school becomes an American Museum Lecture Center. The lectures in no instance take the place of the teacher's work, but instead correlate and supplement it, giving an enriched background for understanding and appreciation in the regular classroom study. Three schools have been created Local Lecture Centers, important among them being the Washington Irving High School, but the system must be extended to other districts just as soon as funds are available for the purpose. Eventually the plan should entail a small permanent museum for each school. Thus the centers would become in truth transplanted vital parts of the mother institution.

The second line of extension is perhaps the most fundamental and important of all plans so far attempted. It consists in carrying a knowledge of the Museum's resources to the classes of teachers in the training schools. There are three training schools for teachers in Greater New York. We have inaugurated the work in only one of these so far, with lectures by the members of the Museum faculty on "Africa," "South America," "Animals of the Past," and the "Beginnings of Life." But surely we contribute to the source of successful child education in New York City when we make these young teachers at the beginning of their work realize by personal experience the interest and value of what the American Museum can give, and if we make them know that they can always get, merely for the asking, this background for their geography or history or literature classes later. They have but to ask for lectures, ask for slides, and they will be delivered free at the schools, or ask for guide or instructor for their classes when they come to the Museum.

These two plans represent work in coöperation with officials and teachers of the public schools of New York City where the American Museum takes the initiative. The third should be expressed as a desire rather than a plan and entails coöperation with existing educational activities where the Museum does not take the initiative. I refer to the work of such organizations as the School Nature League, organized and carried on under the inspired leadership of Mrs. John I. Northrop. The Museum will help in every way possible here, in appreciation of the extremely high character of the work in those parts of the city where such influence is particularly valuable. I refer also to the work in Visual Instruction under Director Ernest L. Crandall. This again is a case where the Museum strongly desires to get behind and help push—its institutional pride being satisfied merely in a furtherance of the good work. Fortunately, this subject is one in which the institution's experience, as in the matter of scientific moving pictures, may prove of practical value.

Historic Trees in America

Relative to the future and the past, and introducing a recent book of accuracy and charm, the "Historic Trees of Massachusetts" [1]

Our historic Boston Common.—"Probably no other spot in the United States has seen so many thousands of men recruited for military service . . . or so many millions of dollars contributed for the cause of human liberty." None of the trees on the Common today is of primeval origin. All have been planted, and range between one hundred and two hundred years of age. The two greatest were "Liberty Tree" and the "Great Elm." The former was destroyed in 1775 and its place is now marked by a memorial table. The Great Elm was the native king of the Common and full-grown about 1722. It was destroyed in a gale in 1876

TO the memory of American soldiers of the World War many thousands of trees have been planted in America during 1919 and this spring of 1920—in groves, along drives, and as individual monuments. The trees are more or less spindling, and do not bear out their impressiveness of meaning; but the greater number have been planted by children, and trees may grow to great size within a human lifetime. In fact, trees may grow to a very considerable height, sometimes nearly fifty feet, in little more than one half a lifetime. So the boys and girls who have planted these mere slips of trees may some day be proud that through their own personal initiative there came into existence such commanding historic monuments.

America has also many ancient trees, of vast dimensions, which have escaped destruction. Fortunately we have even bits of primeval grove and forest left, and thus can know how these young trees of today will look when they have attained to full or late maturity and give shade for the play of children three or four hundred years from now. We cannot deem it strange that man venerates trees when nature has ordained that just a common oak or pine shall live so many times as long as he!

When we read Mr. Simmons' book on the historic trees of Massachusetts, it is as if we walked in memory over Indian trails and Colonial roadways of the years prior to the Civil War. We review stirring events of our early national history. Under the canopy of the elm at Cambridge we proudly greet Washington as he takes command of the American Army. We extend cordial welcome to Lafayette in the shade of that great elm on the road to Palmer where he rested on his way to join Washington. We pass under the five-hundred-year-old oaks, red and white, at Wayside Inn in the town of Sudbury, where the ancient trees give up memories of Washington and Lafayette, and of Longfellow in the century later. We inhale the fragrance of the great pine on the road to Lenox—the same fragrance that delighted Oliver Wendell Holmes so many years ago.

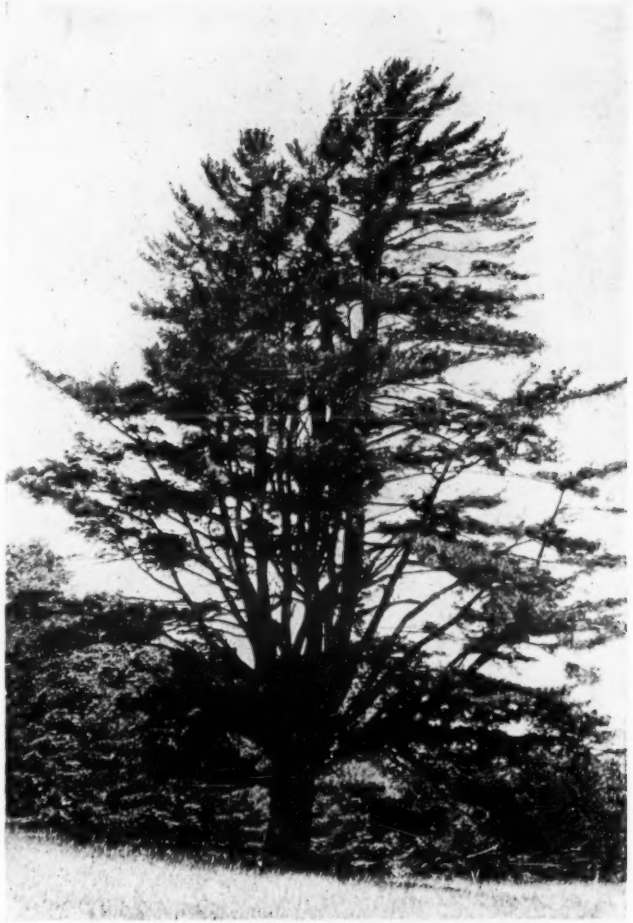
The effect is as if these trees which witnessed the scenes and were there to hear the voices had themselves spoken to us. We put aside the book with a new reverence for trees as living monuments, more fitting than marble or stone to commemorate individual heroism or momentous national event.

And we have become ambitious to plant young trees in some heroic connection, so that they shall be started with a fresh glory upon them into the long and noble career ahead. We are ambitious to honor, under auspicious circumstances which will link them forever with the history of America, the great trees of today. We would bring from obscurity in various parts of the country into the light of appreciation the many unknown trees of historic and human interest. We would send candidates to an American "Hall of Fame" for trees.

[1] *The Historic Trees of Massachusetts.* By James Raymond Simmons, secretary of the New York State Forestry Association, formerly assistant state forester of Massachusetts. Illustrations from photographs by the Author. On the front and back inside covers of the volume is printed a road map of Massachusetts, which locates about forty historic trees for the convenience of automobilists

THE WASHINGTON ELM AT CAMBRIDGE

Great trees, survivors beyond the allotted span of human life, remain the only living witnesses of the events of other generations, and are especially revered as historical or personal memorials by the children's children of those who contributed to their renown. Among the most notable events of the Republic's birth was the assumption of command of all the colonial forces by Washington on July 3, 1775, in the presence of his general officers and troops under the branches of a great elm of the Cambridge Common. This elm, one of the remnants of the primitive forest, is more than 18 feet in circumference and was once nearly 100 feet high and 90 feet in spread of branches



OLIVER WENDELL HOLMES'S PINE

Remnants of the primitive forest, giant white pines are now rare in New England, for they are not naturally so long-lived as the oaks and other hardwoods and are too much in demand by the lumbermen, but the lone pine on "Canoe Meadow" near the old road to Lenox was a favorite of Oliver Wendell Holmes and probably of his father's father. This pine is large for New England—97 feet high and 16 feet, 4 inches in girth—and is unique among Massachusetts conifers in the spread and density of its branches for the tall pines of the remaining virgin forests are likely to have long tapering boles with only a few tassels of green needles at the top

TREE PILGRIMS TO PLYMOUTH

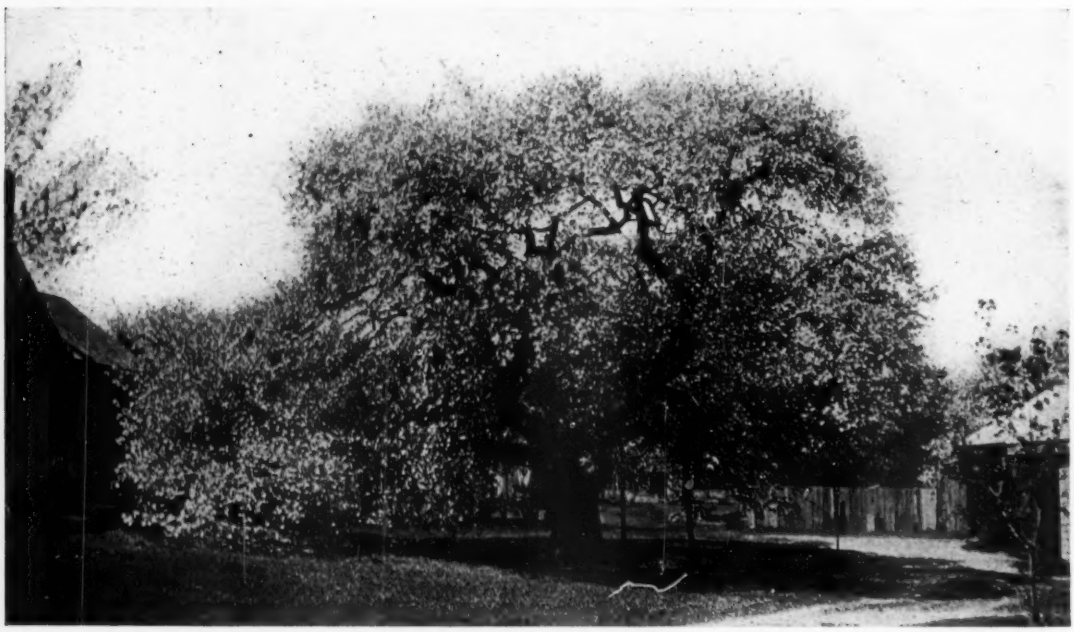
Foremost among the living associates of one's homeland are the trees of the forest and roadside. The English have always been proud of their oaks and lindens so the early colonists brought these tree friends to maintain associations with the homes from which they had broken—and, as it chanced, to give the species permanent place among our native flora. These eight lindens were planted by Colonel George Watson who commissioned a Boston sea captain to bring them to America. They bear an inscription dated 1760, and have stood for a century and a half against the storms of the Plymouth coast

A LIVING WITNESS FROM THE COLONIAL WARS

The crowning beauty of old Deerfield, perhaps New England's quaintest and most beautiful town, is in its elms, maples, and buttonwoods which line the streets and hide the ancient houses, many of which date from the Indian wars. This buttonwood stands near the spot where stubborn defense was made against the French and Indians in Queen Anne's War and must have been passed by Captain Thomas Lathrop when he undertook to rescue grain in Deerfield from King Philip's Indians, perishing with his men in the attempt. The tree is now 18 feet in circumference and 100 in height and spread

WHITE OAK—THE BUILDER OF SHIPS

There was a time when the white oaks of New England were among the most important shipbuilding materials of the world, for oak wood is long enduring in ships as well as when part of a living tree in the forest. In 1797 the Avery Oak just escaped going into the timbers of "Old Ironsides" (still lying at anchor off Charleston) for the consideration of seventy dollars. This tree antedates the town of Dedham, on whose seal it appears, and still stands four-square against the wind with only a scar from lightning. It is traditionally reported that the first religious meeting of the town was held under its shade



A CENTURY OF APPLE BLOSSOMS

An apple tree with an age more befitting that of an oak and with a spread of branches equaling that of a giant elm is noteworthy among trees. The apple tree at Marshfield Hills on Cape Cod Bay is more than one hundred years old and presents in spring a sixty-foot ball of white and pink blossoms supported by limbs nearly six feet in girth

WITH ASSOCIATIONS IN HISTORY AND LITERATURE

The trees of Concord are haunted by connections with the stirring events of 1775 and by the peaceful associations of American literature. Groves and shade trees have from time immemorial been immortalized as the companions of authors who walked or thought, or conversed with nature and friends, beneath the branches. In the house under these elms Louisa May Alcott once lived, and within the deep shade of the pine grove a bowlder informs the visitor that Nathaniel Hawthorne "trod daily this path to the hill to formulate as he paced to and fro upon its summit his marvelous romances"

ANCIENT OAKS BY THE WAYSIDE INN

At Sudbury, west of Boston, is Longfellow's "Wayside Inn" where "Through the ancient oaks o'erhead, Mysterious voices moaned and fled." Ancient even in Longfellow's day, the two oaks—red and white—already dominated the roadside when Washington passed in 1775 on his way to Cambridge to take command of the army, and later when both he and Lafayette stopped at the inn. The poet frequented this famous inn and there found inspiration for his "Tales of a Wayside Inn." The trees are at least 500 years old; one is now hollow but has been braced from within so that it gives promise of ruling for many years among the numerous descendent oaks sown from its acorns in the surrounding fields

PURPLE PASQUE FLOWERS OF A COLORADO SPRING

Hunting with a camera requires as much cunning and patience and endurance as hunting with a gun—a fact which has probably been a potent factor in developing the great interest in nature photography in this country during the last few years. With a camera the true sportsman may indulge his delight in the out-of-door world and his interest in the wild animals and native plants of our country without sacrificing life and beauty in the pursuit. Wild flowers are among the daintiest but by no means the easiest subjects to photograph, because time exposures are necessary for fine detail, and careful work to bring out the true color values. See detail study on page 187

Ground squirrels are endowed with curiosity and large appetites, which fact makes them excellent subjects for the photographer if only he brings a bag of corn. This stocky little Say's ground squirrel (*Callospermophilus lateralis*) is commonly mistaken for a chipmunk, which it closely resembles in marking and habits (See also page 189)

Trials and Tribulations of a Nature Photographer

By ROBERT B. ROCKWELL

Member of the Colorado Mountain Club

TO the casual reader, a well-taken "nature photograph" is merely a picture—of no particular significance beyond the subject it depicts, but to the one who has spent strenuous hours in pursuit of elusive outdoor subjects, it represents far more than the image on the paper before him. One must take an actual part in the game and experience its hardships and accidents, as well as the brilliant flashes of good luck and unexpected success, to appreciate fully the fact that a really good picture of this kind is the result of patience and persistency conquering disappointment and failure. And to this very fact may be attributed the remarkable increase of interest in nature photography which has characterized the last few years in America. For the American sportsman is one who loves God's great outdoors, who glories in a battle of wits with God's wild creatures; and the nature photographer is a sportsman who is quick to recognize in photography the possibility of indulging these fancies without sacrificing life and beauty in the pursuit.

Nor can he who has spent long, freezing hours in a November duck blind, or dragged his weary limbs over miles of fallen timber after deer or bear, contend that his alone are the hardships; for every obstacle which presents itself to the man with the gun has its counterpart for the man with the lens and plate; and as the value of a trophy on the den wall is measured by the effort that secured it, so is the charm of a good picture dependent upon the reminiscences it calls to mind.

One of my first yearnings in the line of nature photographs was for a picture of my pug-

Illustrations from photographs by the Author.

These five-weeks-old Rocky Mountain screech owls were prize portrait sitters because of their great glowing yellow eyes and their alert, fearless manner and comical ultra-dignity, but considerable differences of opinion as to pose and background had to be settled between them and the photographer before this picture could be snapped

nacious little friends, the screech owls, and as I had been much in contact with them for several years in connection with nature study and had held many of them in my hands, I anticipated little trouble in obtaining the coveted portraits. So I took trip after trip and exposed dozens of plates, but the results were uniformly unsatisfactory. His "owlship" would not "smile," or else he persisted in keeping his great yellow eyes tightly closed, or a wandering zephyr blew his soft feathers awry; be the cause what it may, my collection of owl pictures grew amazingly in number, but improved not at all in quality. Until at last—oh, happy hour!—I came upon a nest which I had overlooked on my earlier trips, and brought to light from the hollow tree two wide-eyed, scrappy youngsters, almost fully feathered and ready to tackle in mortal combat anything from a mouse to a grizzly bear. We had a spirited argument regarding questions of pose, expression, and background, but in the end, after several heart-breaking races through the dense underbrush and up a couple of trees, and with my two hands covered with scratches and cuts, the owlets agreed (?) with me perfectly on all points under discussion; the exposures were made, and I triumphantly bade them Godspeed, with what eventually proved to be the coveted pictures tucked into my camera case.

Among my particular ambitions was one to take a good picture of a nest of young grebes. Now, be it known, a baby grebe takes to the water almost as soon as it leaves the shell in its floating nest, and thereafter its moments on *terra firma* are few and far between. So when the proper time came for baby grebes I sallied forth with the big camera and plenty of determination. After a seven-mile tramp over a hot, dusty road I arrived at the scene of action—a small, rush-bordered pond—and immediately began operations. I was not long in locating a favorable nest, and judging from a multitude of tiny squeaks, I surmised that the youngsters were near at hand. After considerable search my eye at last fell upon the first one, all submerged except the point of his bill, and looking exactly like a bit of mud. The second one was hauled forth from under a cat-tail stalk; the third one had crawled under a bit of green moss; and so on, until eight tiny striped babies filled my hat with squirming chaos.

Standing in the stagnant water to my waist, holding my hat full of prizes in my teeth, and fighting a multitude of mosquitoes with one hand while I endeavored to set

Screech owl nestlings have outlandishly big "noses" and large, ungainly feet, forerunners of the formidable weapons they will wield as adults

Pond residents such as the grebes test the persistence and endurance of any man who enters their watery habitat with his desire bent on pictures. The low, floating nest of the American eared grebe is a shaky affair resting on the water and débris of small rush marshes, usually unanchored, and subject to the vagaries of wind and rain. Often the old bird, before leaving the nest, covers the eggs with grass and reeds

Young grebes leave the nest for the water very soon after they come out of the shells, so photographing them in their pond home is a labor of hours. The above picture was taken after a lively scramble with the young birds, but unfortunately the photographer, carrying his camera, stepped into a muskrat hole on the way to shore, after which the plates were somewhat the worse for water and the photographer for pond scum, mud, and various minute living things more delectable to grebes and fishes than to picture hunters

up the camera with the other was, to say the least, rather engrossing work. The slender legs of the tripod no sooner touched the soft ooze under foot than the camera sank to the surface of the pond, and in my wild scramble to avert a dire calamity my focusing cloth dropped into the water and was dragged forth a reeking, ill-smelling mass of green moss and tiny creeping things. At last, the preliminaries being completed, I dumped the babies into the nest, and presto! eight black streaks radiated in eight directions from the nest, with the photographer trying to follow in all eight directions at once. The Marathon runners think they know what "endurance" really means. They should try — just once — to keep eight baby grebes in a nest when those babies hear the call of the wild, and they will readily see what a tame performance a Marathon race is, in comparison. But then, there is a limit to the endurance of even a baby grebe, and at last eight very tired youngsters were safely ensconced in the nest, indifferent to my efforts to pose them. Oh joyous moment! The dreams of many a winter evening were finally realized! The light was perfect, the background all that could be desired, and the water as smooth as glass. I exposed plate after plate and dreamed of the series of grebe pictures soon to be mine. Finally, my last plate was exposed, the holders stuffed into a hunting-coat pocket, and the tramp to the shore begun, when with a mighty splash I stepped into a muskrat hole and sank out of sight, plate holders and all. My negatives ruined! All my fond hopes blasted! And seven miles to more plates! Did I return to take those pictures again? I refuse to answer.

The sight of that tall, silent sentinel, the blue heron, has never failed to arouse in my heart a great longing for his portrait, but years of study had satisfied me that he was an impossible subject. Imagine my delight when, upon a visit to a nesting colony of these great birds, I saw high up in a tall cottonwood a full-grown young of the year, whose actions plainly showed that he had not yet mastered the gentle art of flight.

A nerve-racking climb under a broiling sun and in the stench of the rookery at last brought me to where I could dislodge the bird from his perch, and with set wings he sailed clumsily to the ground, to be pounced upon immediately by my eager companion. Then began a strenuous test of wits, speed, and endurance, for our new-found friend was wild and clever and quick, and could run like a deer. Our ideas and his regarding bird portraiture were entirely at variance, and his opinions were invariably backed up by his actions, so that it became necessary to follow him at breakneck speed over two or three hundred yards of burning sand each time he changed his pose. At last, however, he came to the mature conclusion that *one* bird cannot run down *two* picture fanatics, and the desired exposures were made, the results of which not only fill my soul with joy to this day, but impress upon me the fact that I should have been a professional foot racer.

In direct contrast were the actions of two young black-crowned night herons, which, while they exhibited the modesty that befits all well-reared birds about to be photographed, were so amenable to reason as to allow their photographs to be taken without the usual accompaniment of speed contests.

One of the fascinating features of nature study lies in the fact that the most unusual experiences with birds and animals frequently occur under the most unexpected circumstances. Many an arduous day of keen disappointment, fruitless search, and stupefying fatigue in the field is immortalized in the student's memory by some unlooked-for discovery or delightful glimpse

The striped spermophile (*Citellus tridecemlineatus pallidus*), or "gopher," is a true prairie dweller, frequenting the arid plains east of the Rocky Mountains and seldom entering the timbered areas. We may see it almost anywhere in this region as it darts through the grass to one of its ground holes. Remain quiet for a few minutes, and it will soon reappear, with little black eyes peering out inquisitively. The spermophile depends for protection on a burrow two inches in diameter and from fifteen to twenty feet in length; the tunnel descends suddenly at first, but never more than one or two feet below the surface. In the fall, soon after the first few frosty nights, the spermophiles disappear for the winter among their stores of grain and seeds

THE SPERMOPHILES HAVE LEARNED THE FINE ART OF POSING

When startled, the striped spermophile may "freeze," standing upright on its hind legs, straight and motionless as a tent stake or a picket pin for which it might easily be mistaken. One can then approach to within a few yards before the little animal will drop on all fours and disappear into one of its numerous holes, chattering a long drawn out "chur-r-r-r" in a high key

WILD FLOWERS GATHERED AND TAKEN HOME—BUT NOT DESTROYED

American pasque flowers (*Pulsatilla hirsutissima*), often known as "anemones," blossom abundantly in dry soil among the foothills and mountains of Colorado, adding their purple to the many brilliant colors which make the spring beautiful in that state. As shown in the photograph, they blossom before their leaves appear. This group of pasque flowers was photographed on the low ranges west of Golden, but the species grows as far up as the limit of trees (See also page 180)

into the home life of some wild creature, long after the last vestige of hope for success has departed. Such an experience befell the writer one June day.

A trip was made to the Barr (Colorado) chain of lakes for the purpose of photographing bird life and comparing its abundance and variety with that of several years previous, at which time the writer had done rather extensive field work in the same locality. The Barr chain of lakes (or, more accurately, ponds) is a series of small rush and cat-tail bordered bodies of water forming a part of a large irrigation system, and caused by the seepage of a large reservoir lying at the head of a broad flat valley. The large irrigating canals supplied by the main reservoir form a line of demarcation between the dry, brown, almost desert-like prairie above the ditch and the fertile, brilliant green fields below, where the magic touch of water has converted the parched plain into an agricultural paradise.

The spot chosen for our operations was a rather extensive piece of low, marshy ground, lying between three ponds, where in previous years we had found a wonderfully diversified and abundant bird life, but on this trip our hopes were early dashed away. A few short years had worked sad havoc with this favorite nesting ground. A prairie fire had converted the wealth of cat-tail swamp into a dreary brown waste; a herd of peaceful cattle had effectively tramped out the spots where formerly birds nested by hundreds; a large drainage ditch had converted into rich, dry farming land acres of what had been ideal environment for thousands of our feathered friends.

The great colony of nesting black-crowned night herons and Forster's terns had disappeared. The wild ducks had found less disturbed surroundings, and the only familiar creatures were a number of killdeers voicing their deadly monotonous cry, an occasional red-winged or yellow-headed blackbird, and hosts upon hosts of ravenous mosquitoes and deer flies which drove us promptly into head nets, gloves, and bad temper.

The day wore on with terrific heat, increasing fatigue and disgust, but with very little in results, until, in crossing a small grassy patch, we were greeted with the peculiar musical, subdued "mumph" of a Wilson's phalarope. Hours of fruitless search on many previous occasions had proved the futility of hunting for the wonderfully concealed nests of these charming birds, so that their appearance upon the scene, although exhibiting every well-known evidence of having a nest near by, did not arouse any great hopes in our disgruntled frame of mind.

Imagine our surprise and delight then, when within a few moments of the bird's appearance we discovered the three brownish, black-mottled eggs cozily ensconced in a cunningly fashioned nest tucked in the short grass at our very feet—the indistinct mottled appearance of the eggs blending so perfectly with their surroundings that we hardly dared to take our eyes from the nest for fear of losing it.

The battery of three cameras was hastily unstrapped, tripods erected, and long strings attached to the shutters, at the other ends of which we concealed ourselves and prepared for the tiresome vigil, with decided misgivings as to whether the timid parent bird would return to its treasures with three huge black cameras glowering within a yard of the nest.

To our surprise, within a minute or so the bird, which had been circling about us in the air, uttering its peculiar stifled note of alarm, alighted a few yards away and began skulking through the grass toward the nest, making every effort to keep its whereabouts concealed from us. A tense minute followed, terminated by a low whistle from the observer nearest the nest. At the signal three strings were pulled, three shutters clicked, and three exultant enthusiasts rushed toward the nest, happy in the thought that the much-desired negatives were theirs.

At the click of the first shutter the bird hurriedly flushed from the nest with every evidence of panicky fright, and we supposed that our picture-taking was at an end. But again we were treated to the surprise of our lives, for, even as we were changing our plate holders—all three of us close enough to lay our hands on the eggs—the brave little creature lit within a dozen yards of us and began warily to circle about us in the grass.

Silence and absolute absence of motion are the first lessons the student of wild creatures must learn, so we "froze" in the most approved manner. Round and round us the dainty little bird slipped, its every sense keenly alert, its bright black

"AT HOME" TO THE VISITING NATURE PHOTOGRAPHER

Say's ground squirrel is a characteristic mammal of the open yellow pine and fir forests in Colorado. It lives in rocky ledges, among piles of bowlders, in hollow logs, or digs a burrow for itself under the shelter of logs and rocks. These burrows have several entrances and exits within a small area for quick escape from enemies above ground or below (Photographed near Grand Lake, Colorado)

The Colorado chipmunk (Say's four-lined squirrel, *Eutamias quadrivittatus*) has its center of abundance among the yellow pines of the Rocky Mountains. It is the largest and best-known of the chipmunks of the state, and is commonly seen among the eastern foothills as it frisks about the rocks in the early morning or late afternoon, uttering a quiet "chuck, chuck." With a little patience the photographer may easily catch this chipmunk in a good position for a picture; it possesses great curiosity and is always ready to investigate the man with the camera. The Colorado chipmunk hibernates throughout the winter months in the northern part of its range

eyes snapping with excitement, and the pretty head gracefully dipping from side to side with apparent curiosity and uncertainty, yet, withal, with very little evidence of fear.

Crouching over our cameras in the broiling sun, with no opportunity to assume comfortable positions and with an army of hungry insects ferociously attacking us, we hardly dared to breathe or wink our eyes. Slowly—oh, so slowly—in its circling progress it approached the nest. In our tense, strained position the short minutes seemed like hours. Several times our little friend nearly reached the nest, only to be overcome with a little panic of fright, when with a startled note it would scamper away a dozen feet and we would groan to ourselves. Finally, just when our muscles and nerves were at the breaking point, the bird suddenly took heart and, gliding swiftly forward, settled itself over the eggs, daintily ruffled up its feathers, preened them for a moment with the long slender bill, and then gave its entire attention to watching us. A breathless moment followed, during which we waited for the nervous little head to stop bobbing back and forth,—then the shutters clicked, three more wonderful negatives came into existence, and away went our bird.

Surely this last harrowing experience would be more than any timid bird could endure! But no! We were about to witness what few naturalists even of life-long experience are privileged to see.

Within a few moments our little bird was back and we were treated to the experience of seeing the instinctive timidity of a wild creature overcome by parental devotion to the nest. Although it had twice been frightened from home by three terrible monsters, the strong instinct to cover and protect the three treasures overcame its terror, and back it came, again and again.

This remarkable opportunity for close observation of the Wilson's phalarope brought to light many interesting peculiarities of the brooding bird. It was apparent that the long legs were much in the way; in fact, some moments were spent after settling upon the nest in moving about and turning this way and that in an endeavor to assume a comfortable position and at the same time keep the eggs adequately covered.

The extreme rapidity and the constancy of

motion upon the part of the bird even when sitting on the eggs were surprising and are most clearly demonstrated by the fact that of the negatives made, although our fast shutters were adjusted for the shortest exposures, only two or three were perfectly sharp in every detail of the bird.

Of the many times the bird flushed from the nest, not once did it spring directly into flight, but in each instance ran a step or two before taking wing; yet so extremely rapid were all its movements that at a distance of twenty feet the observer would not realize this fact.

The prize subject of our outdoor photography, however, was a young gopher, which was encountered one Fourth of July on a sandy flat, with the temperature ranging upward to 100 degrees. "His Nibs," as we promptly named him, was apparently possessed of a gnawing hunger and a remarkable capacity, for, during the half day we spent in his charming company, the amount of corn (placed there to give him an interest in the proceedings) which disappeared from about the entrance of his burrow would do credit to a work horse. We photographed him coming out of the burrow, going into it, sitting up, lying down, "meditating," and in various other positions, and the eighteen pictures of that poor overworked little gopher are in themselves an index of his moods and fancies.

The rarest opportunities for good pictures often come at the most unexpected times. Near the end of a cruelly hard day's tramp which had been entirely barren of results, my eye was caught by a bit of color almost at my feet, and there lay a perfectly beautiful specimen (if you can imagine such a thing) of the blue racer. He lay entirely at ease, his brilliant coils glistening in the afternoon sun, a "pose" one could not have secured by hours of patient work. A moment of breathless focusing, two careful exposures, and the deed was done. Result, two pictures that would fill the heart of a snake charmer with delight; and the entire operation did not take five minutes.

Not the handsomest, yet one of the easiest of nature subjects is that bluffer, the bull snake. Ferocious in appearance, size, and in everything but fact, he imagines himself as terrible to the photographer as to the baby birds upon which he feeds, and the practical absence of fear of mankind

The nocturnal beaver is not a good subject for the camera, but its carpentry is much in evidence in any region where this hard worker abounds. Beavers spend their nights in and about the water, felling trees, building dams, erecting their houses, and storing short lengths of branches on the bark of which they feed during the winter. Sometimes, as shown here, they attack the farmer's fence post; their instinct does not tell them that they cannot carry it away. Since the beaver has been protected in Colorado, it has multiplied favorably and is to be found even within the confines of Denver. The photograph was taken on the South Platte above Brighton, Colorado

makes him easy to approach and handle. The only obstacle to be overcome is that he is so very long and so very narrow, he does not always fill the plate to the best advantage.

Among the most difficult subjects are the insects. Because of their small size it is necessary to take them at very short distances (usually less than a foot), and this so limits the field of the lens that only boundless patience will catch the subject in exactly the proper spot at the right instant. Their quickness makes very fast exposures imperative and nothing short of the finest equipment in lenses and shutters is capable of satisfactory results.

The daintiest of all subjects—the wild flowers—are not nearly so easy to photograph effectively as one would think. Time exposures are necessary for the finest detail, and the tiniest breeze starts the pretty heads waving in a manner wholly exasperating to the man under the hot focusing cloth. Furthermore, true color values are more or less difficult to secure and most of the work must, of necessity, be done very close to the ground if the flowers are to be photographed *in situ;* but, as in the other cases, the results more than compensate one for the labor, and the trophies are a constant source of joy.

Among the easiest and most satisfactory subjects are birds' nests. The surroundings of the nest usually furnish beautiful settings, the light can be controlled by means of screens, and best of all, the subject will not run or fly away while you are preparing to photograph it.

Many species of young birds are ideal subjects. Young flickers, when carefully handled, are especially tractable and can be posed in the desired setting with comparative ease. Humming-birds are also easy to photograph when around their nests. They have little fear of human beings and soon become accustomed to the close proximity of the formidable-looking camera.

In conclusion let me say to you, my fellow lover of the wildwood, try the sport of photographing your friends of fur and feather if you want real sport. When you approach a wild creature with a gun, you approach it as a deadly enemy, and in your effort to bring it to bag, you overlook the individuality of your quarry, its whims, peculiarities, and characteristics, but when you approach it with a camera, you come as a friend, and even the wild things are quick to recognize the difference. You will come into closer comradeship with the things that creep, run, and fly, than you ever dreamed possible. You will look upon the outdoors with the kindly eye of the friend instead of the cold eye of the life-taker, and you will return from the hunt with trophies as hard to secure, as highly prized, and as valuable and lasting as those of any Nimrod that ever lived. But you must enter the game with determination, grit, endurance, patience, and the inherent love of the earth's wild creatures without which no one can succeed in nature photography.

We discovered a Wilson's phalarope (*Steganopus tricolor*) by accident near Barr, Colorado. The species is common on the shores of marshes throughout the prairie region, but a search for the nest is usually without result, so skillfully is it hidden

South American Field Notes

With special reference to the habits of two species of birds, the jabiru and the rhea

By GEORGE K. CHERRIE

South American Field Collector and Ornithologist

IN OUR ascent of the Paraguay River[1] perhaps one of the most striking birds we saw was the giant stork, or jabiru, which, until we made this trip, I had thought rather an uncommon bird in South America. Along this river, however, we saw actually thousands of these birds—and seeing them reminded me of my first experience in collecting jabiru.

I was at that time in the employment of the Museum of the Brooklyn Institute of Arts and Sciences, and the director, Dr. Frederic A. Lucas, was very anxious to secure specimens of this stork, as there had then never been a complete skin or skeleton in any of our museums. Accordingly, an expedition was arranged which had as its primary object the obtaining of specimens of jabiru.

On some of my previous trips I had seen an occasional jabiru in the Orinoco Valley, and knowing that country very well, I decided that I would go back to the Orinoco region and make my search for jabiru. After I had made my way up into the interior above Ciudad Bolivar, the real search for the storks began, and for about three weeks I hunted just about as hard as it is possible to hunt,—that is, I tramped daily across the open plains, and made my way through the bushes along the water courses, and through swamps and marshes. But all was of no avail—there were no jabiru to be found.

Then I arranged an expedition from the little town of Caicara back toward the hills on the borderland of British Guiana. Three days' journey from Caicara we made a stop at one of the outlying cattle ranches, Las Guacas, on the San Felice River near its union with the Cuchivero. Here, the second morning after our arrival, as I was wandering along the shores of a great marsh, I espied a jabiru on the opposite side, fully five hundred yards away. I wanted that jabiru, and I wanted it badly. At the time I was using a sporting Mauser 30-30 rifle. I lay down on the ground, put in a metal jacket bullet, and took very careful aim at the bird as it stood quartering toward me. At the report of my gun the bird went down.

The next problem was to get my game. To go around the big marsh meant an hour, or perhaps two, of tramping through the broiling hot sun. During that time some animal, one of the larger hawks, or possibly a vulture, might destroy the specimen. The idea of losing it I would not even consider after my long hunt. So the only thing to do was to wade, or swim, across the marsh to the place where the bird had fallen. I removed my clothing, laid my gun carefully on top of it, and, wading most of the distance and swimming where necessary, I reached the opposite shore and saw the bird lying before me, the white of its wings spread wide on the grass of the marsh. Then suddenly, without any warning, the bird started to get to its feet. It attempted to open its wings, but was unable to do so. I instantly realized that my bullet probably had passed through the body and had at least broken both wings, so I thought that in any case the jabiru was easy prey. Then the bird started to walk away from me. I increased my pace; the jabiru took steps just a bit longer. Presently the jabiru was walking at a good lively gait, and I was running as fast as I could. I knew just how ridiculous a sight it was.

Finally I had to give up, the bird simply "walked away" from me; and there was nothing left for me to do but return, cross the marsh as best I could, get my clothing and my gun again, and take up the hunt for jabiru once more. I might add, perhaps, that a few days later I was more fortunate in securing specimens, which were later brought north, and now form an exhibit in the Brooklyn Museum collections.

On the Roosevelt-Rondon Expedition we saw also, as we ascended the Paraguay

[1] The Roosevelt-Rondon South American Expedition, 1913–14, AMERICAN MUSEUM JOURNAL, February, 1915.

River, a good many nests in trees that stood isolated from other forest growth, sometimes near the river bank, and again well back in the open or *campo* country. On the original Roosevelt expedition, 1913–14, we obtained only two specimens, and the time at our disposal was too short to make any extended observations as to habits. On the supplementary trip,[1] however, in the interior, at Fedegoso, Matto Grosso, several nests were found within a radius of about three miles from our camp.

One of the nests contained half-grown young, and I was much interested in their behavior when the nest was discovered. At my approach the two young birds, which had been sitting quietly side by side in the nest, got to their feet and began walking around and around the great platform of sticks that formed the nest. As I came closer, they came to the side of the nest nearest me and indicated their displeasure at my presence by viciously snapping together the two mandibles. Then they walked gravely around and returned, still continuing to snap their mandibles. This they kept up for nearly an hour; then one of the old birds appeared on the scene.

As the parent bird alighted on the nest, the two young birds immediately crouched down. The mother was evidently much annoyed; she snapped her mandibles together as the young birds had done, but in her case it was a more decided and vigorous performance. All the time she was on the nest the young birds remained quiet. Apparently this was a case where young folk were supposed to be seen and not heard.

From the natives I learned that the nests of these great storks are often used year after year by the same birds, which never leave the immediate district where their home is located. Jabiru nests are usually placed in very large trees isolated from other forest growth, and consist of a great platform of dead sticks (these sticks are often three and four, and sometimes five feet in length, and as much as an inch and a half in diameter). I found one exception in this character of environment. One pair of birds had built their nest in the center of a group of nests of the wood ibis, picking out, I think, the tallest tree, and placing the nest in the extreme top of the tree. From this station the parent birds could overlook the entire colony of wood ibis, and also have an unobstructed view of the country all about. In the crevices between the sticks of quite a number of jabiru nests which I saw, were built the nests of small birds; and the common green parrakeet (or as I think it should more properly be called, "the apartment-building parrakeet") very frequently used the bottom of the jabiru's nest as a foundation from which to build downward its nest structure containing many apartments.

We left Descalvados, on the Paraguay River, and at the end of a two days' journey eastward across the Panateles, reached one of the outlying cow camps, known as "Fedegoso." Stationed here were half a dozen cowboys, and there were two small ranch houses as a protection against the rains. The camp was located in a part of the country that is under water for probably at least six months in the year, but at the time we reached there it might almost have been described as in the center of a desert—as far as drinking water was concerned. The six cowboys obtained water for household purposes from a shallow pond perhaps a hundred feet in diameter located quite near the ranch house. Into this pond the men, when returning from a day's ride, would usually take their horses, carefully bathe them, less carefully bathe themselves, and then dip up a sufficient quantity of the same water for drinking and kitchen purposes. There was no other water within many miles of that camp. As a consequence, the water we drank there was usually boiled, and boiled pretty vigorously. Also we had to flavor it with tea or coffee; but even in that way we were unable completely to conceal the disagreeable taste of decaying vegetation.

There was, however, some compensation for having to live in such a camp. For instance, in the neighborhood wild rhea were frequently seen, sometimes not more than fifty yards from the camp, and as long as there was no movement in the camp, the birds remained apparently unconscious of our presence.

One day an old male rhea came out into the open to exhibit his flock of from twenty to thirty young, a most interesting sight. The parent bird would keep his head lowered for about fifteen seconds, rarely

[1] "To South America for Bird Study," Cherrie-Roosevelt Expedition (1916), AMERICAN MUSEUM JOURNAL, April, 1917, pp. 269–273.

longer, then he would stretch his neck to its full length and look in every direction over the open plains. The flock of young followed closely at his heels, and on one or two occasions there was probably some warning sound or sign given, because we could see the young birds squat down and lie motionless until the old bird again gave the signal that danger was past.

On another occasion, when riding quite near this camp, we discovered a family of young rhea, perhaps not more than a week, or at most, ten days old. We were anxious to obtain a number of young to be used in the building of a museum group showing characteristic bird life of the Panateles, so we determined to ride down some of these young birds and capture them. But it was much more easily said than done. We put spurs to our horses and galloped just as hard as the animals could go toward the old rhea and his charges. We did gain on them, but it was a slow, hard race, and just at the last moment when we thought we were on the point of reaching our goal, the young rhea disappeared as if by magic. A few minutes previous they had been scattering farther and farther from one another, and perhaps at the last the old bird had given the signal to disappear. In any case, every bird was gone—of course lying flat somewhere, with its neck outstretched, as we had before seen them. But we searched an area of perhaps a hundred yards and thought we walked over every foot of the ground, yet not a single young rhea did we find. An hour later, when we came back to the same neighborhood, we saw, in the distance, the old male hurrying his flock of young toward a belt of timber which would offer even better concealment than the open where they had evaded us.

The males, the careful guardians of the young, were not always so successful, and at Fort Wheeler, in the Paraguayan *chaco*, I succeeded in getting young rhea. They were much more wary than were those about Fedegoso. There for several days I had noted old birds which at a distance looked very much as though they were accompanying young birds, but not until early October was I successful in getting any for the Museum. One morning, as we were riding, in open country in which there were many clumps of trees with thick undergrowth offering admirable protection for birds and other animals, we saw an old rhea. Ordinarily the males, and the females also, when alarmed keep to the open and depend on their speed for protection, but this fellow, the moment we came in sight, made a rush for the thick woods. We hurried after him as fast as possible, hoping that he would skulk along the edge of the forest.

Courtesy of Leo E. Miller

From one of these rhea eggs twelve persons may be served a breakfast that furnishes the necessary nutrition and satisfies the palate. Natives sometimes find single eggs scattered here and there over the ground, but usually they rob the nests, which hold eggs deposited there by various female rheas to be incubated by the male. The eggs of the most common species are bluish in hue; others have a yellow tinge

On reaching the margin of the woods we stopped and listened, and heard the plaintive calls of young rhea. We had not suspected that there was a family with this old bird. Noting the direction of the sound, we immediately plunged into the forest, regardless of torn clothes and lacerated hands, and forced our way through the underbrush. Very soon we caught sight of the old male as he rushed back and forth from side to side, at once urging and encouraging his charges in their flight, and at the same time endeavoring to lead us off the trail. Every few moments he would flap his wings in a way that produced a peculiar rustling sound, no doubt a signal to the young birds to hurry, and at the same time he would emit peculiar little gruntlike sounds. Apparently most of the young were being driven ahead of their protector. A few, perhaps the weaker ones, were falling behind; and it was the desire of the old bird to protect and succor these that led to our discovery of some of the poor little chaps. Two of the weakest ones had been caught in a tangle of briers of the kind known in New England as "beggar-lice," and were held prisoners there. Others we caught in a wild scramble through the woods.

As soon as we caught one of the young birds it would seem to submit, but did we loose our hold ever so slightly the little thing would free itself with a quick jerk and the race was on once more. We hadn't brought with us on that particular day anything in which we could carry a dozen lusty young rhea, but my Indian guide took off his cotton shirt (and I am sure that he felt more comfortable without it), tied a string about the bottom of it to form a bag into which we thrust our birds—and they are now all awaiting their preparation to form part of the group that will show young America a bit of wild life from the Panateles.

It is perhaps worth while to record another little incident regarding the rhea's ability to conceal itself. One day I was riding through the tall grassland, my Indian companion only a few yards behind me. I rode close to a little clump of trees and looked from right to left as I passed them. After we had gone about a dozen yards, my Indian friend approached me with a "Hist!" I turned my head and looked. He did not speak a word, but motioned back of him. I didn't know what he had seen, but I knew something interesting was there. He led me back to within perhaps ten yards of the foot of the trees which I had just examined so carefully. For a moment I saw nothing; then it slowly dawned upon me that something was outlined on the ground. I approached cautiously a little nearer, and gradually realized that what I had taken for a bowlder was a male rhea covering a nest of eggs. The body of the bird was drawn as closely to the ground as possible, with the neck stretched straight forward on the ground. There was not a movement even when I approached to within a dozen feet of the bird. But at the click of my camera the old fellow sprang to his feet and dashed away across the open plain. Before me lay a nest of thirty-seven eggs. The nest itself was only a slight hollow in the ground. To me the most interesting thing was that, for a radius of about six feet, the tall grass had been carefully cropped, and the grass itself used as a nest lining. My Indian guide explained this habit of cropping the grass by the fact that very frequently at this season of the year, when the grass is very dry and inflammable, fires are started that sweep mile after mile of the open country, over and around many nests of the rhea. By cropping the grass the rheas are able to save their nests from destruction. My guide even insisted that frequently the male rhea sticks to the nest while a fire sweeps around him. Personally, however, I should not like to stand sponsor for that statement.

During the laying season, rhea eggs are frequently found scattered here and there in the open. Such eggs are, of course, never incubated, but they add very much to the food supply of the Indians who wander about over these plains. The Indians, and also all of the ranch owners and cowboys of this region, use not only the eggs of the rhea, but very frequently also the flesh of the bird. The latter I tried upon one or two occasions and, while I believe that careful preparation would improve it, yet I should hardly recommend it. The plumes of the rhea are, of course, marketable everywhere throughout the region the bird inhabits, and the Indians employ the skin as well, tanning it as they do the skins of mammals, and making it into bags and receptacles of all sorts.

THE BROWN PELICANS

A SERIES OF PREVIOUSLY UNPUBLISHED PHOTOGRAPHS OF THE BREEDING BIRDS ON THE LOUISIANA GULF COAST, WITH NOTES ON THEIR HAUNTS AND HABITS

BY ALFRED M. BAILEY [1]

A GRAVE AND STATELY ASSEMBLAGE

One half the brown pelicans found in the United States live along the Louisiana Gulf Coast, and the irregular shore line, cut as it is with innumerable bays, dotted here and there with small islets, is an ideal habitat. There are no coral reefs, but great mud bars stretch from little islands of sand, and the deep bayous which extend far back into the low coastal lands pour a flood of muddied waters into the shoal places in which the pelicans like to dabble.

The greater number of the sea birds nest on the little mangrove islets of the Chandeleur chain, the inside islands of Breton and Mississippi sounds, and those extending westward to Timbalier. The Mud Lumps and Chandeleur have the chief pelican colonies. The Mud Lumps are at the mouth of Pass á l'Outre, the easternmost pass through the delta of the Mississippi, and are about twenty in number, varying from a few yards to a few acres in extent. The vegetation is scant; nightshade and a few coarse grasses grow sparingly. Some of the smaller lumps have not even a blade of grass. In fact, all the islands are so densely packed with birds that vegetation could not grow abundantly. After several trips to the islands with various naturalists, and taking the average of our estimates, it would seem that not fewer than fifty thousand pelicans congregate—all of them in sight at one time!

Fortunately these sea birds are now protected by federal and state coöperation. Poachers no longer interfere with them to any great extent, and patrol boats are kept constantly in the vicinity by the State Department of Conservation

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[1] These observations and photographs on pelicans and a series on terns which will appear in the May–June issue of NATURAL HISTORY were made by Mr. Bailey when he was a member of the scientific staff of the Louisiana State Museum. At present Mr. Bailey is a member of the United States Biological Survey at Juneau, Alaska. A previous article by Mr. Bailey on the water birds of Louisiana appeared in NATURAL HISTORY, Vol. XIX, pp. 45–72.

THEY DELIGHT TO SPORT IN THE MUDDIED WATER

The colonies on the Mud Lumps are well protected by nature, for they are above the highest tides and harbor no carnivorous mammals. The large mangrove keys, however, are differently situated. Grand Cochere, in June, 1918, had twelve hundred nests of pelicans. In July only a few hundred nests remained, owing to the ravages of raccoons. In June, 1919, two feet of water covered the whole island. Raccoons and storms cause the greatest loss to the bird colonies. Rows of birds' eggs may often be seen where the waves have washed them into depressions.

The pelican is a surface feeder entirely, for although it dives downward through the air, it rarely disappears below the surface of the water. During the breeding season brown pelicans feed almost entirely on a bony sardine unfit for human consumption. This fish is so abundant in the warm, shallow waters that a much larger bird population could be supported without endangering the food-fish supply of the people (See NATURAL HISTORY, Vol. XIX, pp. 41–43, concerning investigation of the food of the brown pelican)

STICKS FOR THE NEST ARE ALWAYS AT A PREMIUM

Brown pelicans gather pieces of sticks and fashion a crude nest on the ground in April. The nests first built occupy the outer islands and are better prepared than those made later in the season, when only picked-over material is to be had. By June, if the old birds desire to keep their house intact, they must guard it continually, for the other nest builders have no compunctions about removing the houses from around the young birds. Battles are waged constantly and invaders routed with snapping of beaks and flapping of wings. The pelicans crowd on the outer islands until standing room only is available; then they gradually fill in the islands nearer the shore—which are likely to be occupied by raccoons also

PARENTAL INSTINCT

Three chalk-white eggs are deposited soon after the clumsy nest has been formed, and in time three naked, black, "india-rubber" birds feebly beg for food. The young birds grow rapidly, and the white down increases until the whole rookery is clothed in white. The young are constantly attended by one of the parents, especially at the earlier stage, and shielded with drooping wings from the direct rays of the sun. Soon, however, they leave the nest and go blundering about the island, joining in every "free for all" where chances for food seem at all favorable

AT MEALTIME IN THE PELICAN WORLD

Feeding the young takes place at all hours of the day, but there seem to be two regular mealtimes. In photographic work I found the chances poor for getting feeding pictures between eleven and three. The whining young bird anticipates the arrival of the parent several seconds. Therefore, when a bird grew particularly noisy, I hastily focused on it. It is almost impossible to get a good picture when several of the three-fourths-grown birds attempt to feed, because there is such a tangle of wings and legs. The youngest unfeathered pelicans make the most interesting subjects to photograph. They are so feeble that they can scarcely balance themselves, and when reaching upward to get the fish, are completely enclosed in the parent's pouch. Their tenacious disposition is admirable; they stubbornly insist on trying to swallow a fish larger than themselves until some obliging neighbor waddles along and removes the temptation

Charles Gordon Hewitt—In Memoriam

Biographical notes and an appreciation of the character and achievements of the late Dr. Hewitt by the Commission of Conservation, Ottawa, Canada

IN the death of Charles Gordon Hewitt, Dominion Entomologist and Consulting Zoölogist of the Canadian Commission of Conservation, the biological sciences have lost a leader of exceptional ability. Not only was he held in the highest esteem by his colleagues of the Dominion Entomological Service, but entomologists generally the world over appreciated his brilliant attainments and marked executive ability. Although eminent in entomology, his studies were by no means confined to this science. A broad survey of economic zoölogy from the national standpoint occupied a large share of his thought particularly during the last four or five years of his life.

During Dr. Hewitt's eleven years of office he developed the Dominion Entomological Service from a very small division attached to the Experimental Farms Branch, to an important separate branch of the Department of Agriculture. This was his most important achievement and the organization he perfected will remain a tribute to his great ability and zeal. The breadth of growth of the Entomological Branch is instanced in the establishment of important divisions at Ottawa, such as the Division of Field, Crop, and Garden Insects, the Division of Forest Insects, the Division of Systematic Entomology, and the Division of Foreign Pests Suppression, all under the immediate direction of highly qualified chiefs. In addition to these divisions of the work, special officers have been placed in charge of such lines of study as Natural Control Investigations, Insecticide Investigations, and Stored Product Insect Investigations. In the various provinces, too, field or regional laboratories have been established, with trained entomologists in charge who study local problems and disseminate information of value to agriculturists, horticulturists, lumbermen, and others.

In 1909, Dr. Hewitt recognized the importance of legislation to prevent the introduction or spreading of insect pests and diseases destructive to vegetation, and as a result of his efforts Parliament, in May, 1910, passed the Destructive Insect and Pest Act. Under the regulations of this Act inspectors were appointed to deal with the threatened spread of the brown-tailed moth in the Maritime Provinces, and provisions were made for the prohibition, fumigation, or inspection of nursery stock at definite ports of entry. In addition to the brown-tail scouting work, which he developed in cooperation with the provinces of Nova Scotia and New Brunswick, he arranged for the collection in Massachusetts and establishment in eastern Canada of thousands of parasitic and predacious enemies of the brown-tailed and gipsy moths. Dr. Hewitt was keenly interested in medical entomology and accomplished much useful work on problems related to the house fly, mosquitoes, ticks, and other species which spread disease.

He was the author of important books and memoirs. His chief published work is the well-known book on the house fly of which there were two editions. A smaller book on the same subject appeared later as one of the Cambridge Manuals of Science and Literature. His departmental publications consist of a series of annual reports (1910–16), bulletins, and circulars; chief among the last are those dealing with the honeybee and the large larch sawfly. Very recently he completed an important work on the conservation of the wild life of Canada, the manuscript for which is now ready for the press. The publication in 1919 of the various parts of an important volume on the insects collected by the Canadian Arctic Expedition, 1913–18, was brought about under his direction.

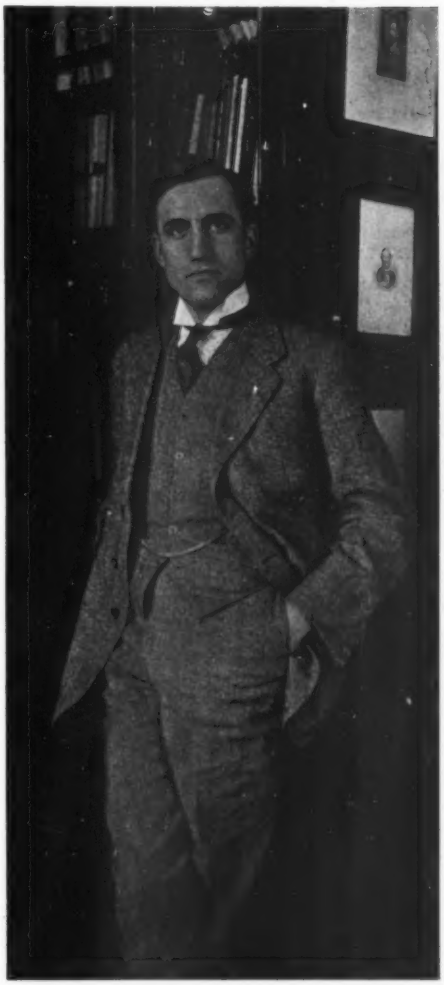
Dr. Hewitt's high reputation was by no means confined to Canada. In addition to a wide appreciation among scientific workers in England his rare abilities were soon recognized by entomologists in the United States, where economic entomology particularly has reached such high development. In the year 1913 he was honored by being elected a fellow of the Entomological So-

ciety of America. In 1915 he was elected president of the American Association of Economic Entomologists. He accepted the presidency of the Entomological Society of Ontario, Canada, in 1913, and in the same year was elected a fellow of the Royal Society of Canada. He was appointed honorary treasurer of the Royal Society in the following year, which office he held at the time of his death. He was a fellow of the Entomological Society of London, England, a corresponding member of the Zoological Society of London, and was an honorary fellow of the Royal Society for the Protection of Birds (London, England). The gold medal of the last-named society was presented to Dr. Hewitt on March 12, 1918, in grateful recognition of successful efforts to further the treaty between Canada and the United States for the protection of migratory birds. He was a recognized student of wild life preservation and rendered valued service in the capacity of secretary of the Advisory Board on Wild Life Protection. In March, 1918, he was elected president of the Ottawa Field Naturalists' Club for the year 1918–19.

A short time before his death he was chosen as the first president of the recently organized Institute of Professional Civil Servants. In addition he was president of the Ottawa Boys' Home, and an ardent supporter of the Boy Scout movement and a councilor of the Ottawa Humane Society.

Dr. Hewitt was born near Macclesfield, England, on February 23, 1885. He received his early education at the King Edward VI Grammar School, Macclesfield; afterward he entered Manchester University and received the degree of B.Sc. in 1902, M.Sc. in 1903, and D.Sc. in 1909. In 1902 he was appointed by his alma mater assistant lecturer in zoölogy, and from 1904 to 1909 occupied the position of lecturer in economic entomology. In 1909 he received the appointment of Dominion Entomologist and left England for Canada. His title was changed to that of Dominion Entomologist and Consulting Zoölogist in 1916.

Dr. Hewitt had attended the meetings of the Commission of Conservation, at Montreal, on February 18–19, last, at which he presented an important paper on "Fur-bearing Animals, Their Economic Significance and Future." Soon after his return to Ottawa on the twentieth he was taken seriously ill with influenza; this developed into pleural pneumonia and he died on February 29.



The late Dr. Charles Gordon Hewitt, Dominion Entomologist and Consulting Zoölogist of the Commission of Conservation, Ottawa

The versatility of Dr. Hewitt's interests in science, literature, art, music, and social welfare, combined with his great personal charm, had endeared him to many friends. His remarkable ability and well-directed ambitions—together with the beauty of his character—enabled him to accomplish more in life's work and in life's friendships during the thirty-five years he lived than is compassed by many of us in a long lifetime.

John Burroughs in Moving Pictures

Extracts quoted from *Nature Notes*, of February, 1920, by courtesy of his publishers, Houghton Mifflin Co.

ONE bright autumn day in 1919 Mr. Burroughs dropped into the Nature Bureau office and invited its secretary to "go to the movies" with him. Such an odd suggestion from one who holds artificial amusements in light esteem! But it turned out we were bound for a private showing of a film made in Roxbury, New York, birthplace of Burroughs, with himself as screen hero. Fancy the amazement of young John Burroughs, back in about 1850, had any one told him as he plowed the red loam of those Catskill fields near the old homestead, that a famous photographer would come more than a half a century later, with a camera so wonderful as to be almost witch-work, to "take" him and his famous Catskill scenery for a permanent record.

The keynote of the Burroughs film is struck with his own words,—"The longer I live the more my mind dwells upon the beauty and the wonder of the world." In his own handwriting we see this happy introduction to the scenes that follow. The film shows Burroughs, ruddy with health and tanned with his out-of-doors living, in old, wide-brimmed straw hat and worn sweater . . . He peers into the R. F. D. box in front of Woodchuck Lodge, and beaming like a boy at a Christmas tree, he digs out bundles of papers and letters . . . He trudges off to the house with them, then comes out—too fine a day to stay indoors. Across the garden patch he comes, headed for his "barn door study" . . . His desk is only a board on a box, but Burroughs is at home with such rude accommodations. See him grab up his field glass,—quick!—we all but see the bird flash past. He looks on to hills and flowery meadows, with the wind rippling the leaves and grasses . . . Here come three youngsters, a barefoot boy and two smaller girls, trotting down the road. Burroughs spies them and waves. They break into a run and come up panting. Burroughs pats the littlest one . . .

"Want to go exploring?" we fancy he's saying, for the kiddies grin and prance. "Come on, then, the wild things don't mind my bringing callers."

Mother Bluebird's nest in the big apple tree is Sight 1. Not far beyond is a stump, baited with corn and an apple—see that saucy chipmunk winking his eyes at the callers. A frisk of his tail and he's off. A few steps farther Burroughs points to a big, flat stone and pulls it up . . . A second later, a close-up shows the scurrying ants disturbed when he "lays bare to the sun the streets and galleries of their orderly kingdom." . . . The sight-seeing group passes through a meadow thick with wild flowers, and Burroughs points to a stalk of wild sunflower. A close-up shows us what they are all peering at—a gorgeous bronzy butterfly lazily opening and shutting its wings, as it feeds on the sweets tucked away at the heart of the flower. Burroughs whips out his hand lens and shows them a common hawkweed. Under the glass it looks as showy as a prize chrysanthemum! And on its stem, what do we see but a solemn grasshopper, "clown of the insect world," Burroughs dubs him. He almost seems to know he is being watched, and wags his feelers at us ludicrously . . .

Well, these "sights" are hot in the sun, and the natural history class is glad to turn aside to the spring, where Mr. Burroughs lies flat down and shows the children how to get a drink nature's way . . . At the edge of the spring is a spotted wood frog . . .; and right under that bunch of ferns Burroughs picks up a newt,—it looks almost jewel-like against his bare palm. The film hurries along, and now we are watching a short lesson in geology. Burroughs points to the hills, and then shows the children glacier marks on the rocks along the road, scratches made ages ago when the glaciers were helping grind down those hills. And years and years ago, before John Burroughs had thought anything about geology, he put his boyish initials on the rock, and here they are . . . Now we see him bidding good-bye, and waving as the children scamper off. They don't know it, but the best lesson they have been learning is a scrap of Burroughs' philosophy:

" . . . The essential things in life are near at hand, and happiness is his who but opens his eyes to the beauty which lies before him."

Nature in New York's Lower East Side

An introduction to the work of the School Nature League of New York City

OF the hundreds of thousands of children living in crowded quarters in New York's Lower East Side, many have never seen a growing flower, and do not know that a frog, a lizard, and a shark look nothing at all like a caterpillar. But they have been taught how a flower springs up from a seed and a caterpillar becomes a chrysalis and then a butterfly, and they are all eagerness to see these phenomena. They cannot be taken to the woods, so the woods are being brought to them through the work of the School Nature League, an organization which came into existence three years ago as an outgrowth of Mrs. John I. Northrop's work with committees from the Associate Alumnæ of Hunter College and the Public Education Association.

The Board of Education of the city of New York has permitted space to be set aside for the exhibition of nature material in seven public schools, and every day the children come with their teachers at the scheduled hours for lessons. Then, to certain of the nature rooms, they are allowed to return to show their parents or their small brothers and sisters the unknown wonders. The material is necessarily limited and requests of the teachers of other schools for rooms have had to be refused, as the membership of the League is small and the heavy work of collecting, distributing, and caring for specimens is done by volunteers. But pupils from schools near by are brought to visit the established nature rooms, and twice a week material is distributed to any teachers who apply for it.

Each nature room has an aquarium set in the midst of a miniature sandy beach strewn with shells and starfishes. There are various mounted birds and small mammals (loaned by the American Museum) which are arranged in their habitats whenever these are possible of duplication in a simple way. Many birds' nests have been contributed. There are tables of garden flowers and wild flowers which, like the other exhibits, are made to vary with the seasons. Moss gardens with their small sprouting ferns, creeping vines, and shrubs in bud seem to give these city children an inexpressible happiness. Even stones and the bark of trees are objects to be examined with close attention and respect. One boy, of limited experience in country scenes, happily and with conviction summed up the whole impression by saying it was "just like a cemetery."

Perhaps the success in teaching appreciation of nature is most noticeable at the school for the deaf and dumb (Public School No. 47). Here, in the small space allotted on the platform of the assembly room, gather the eager, smiling boys and girls. To them this breath of the out of doors means more than to the ordinary child. Many of them manufacture, in paper, models of the flowers they see, and later they duplicate them in cloth and silk, for this school tries to give an equipment for earning a livelihood, and one of the many methods is through supplying the commercial flower houses of New York.

Three times a year special flower exhibitions are held in schools having no nature rooms and situated in neighborhoods remote from the schools which have them. Contributions are sent in from many people, and for three days some grade school play-room is transformed into a "florist's shop." Each "show" is visited by three or four thousand children who are gaining their first knowledge of plant life—not so much knowledge relatively, perhaps, as the desire for it, which is really the purpose of the exhibit. The children display an eager pride in learning names and being able to "match them up with the flowers," but their delight is no greater than that of their mothers, who are invited to attend in the afternoons and who are usually waiting for the trucks which bring the plants, hoping to be able to beg a flower to take home.

Even these occasional exhibits seem to make a lasting impression on the child mind, and the interest in reading lessons and the school stereopticon steadily increases. For nature study is not only visual instruction but inspiration as well when it is carried into the Lower East Side.—RUTH E. CROSBY, Assistant Curator in Public Education, American Museum.

Progress in Saving the Redwoods

Congressman Lea's resolution passes the House of Representatives

IT will be a matter for rejoicing to those who have followed the movement to save the redwood forests of America and have been heartily wishing success to the bill introduced at Washington in 1919, by Congressman Lea, of California, to know that the following resolution passed the House of Representatives on May 3 (an item which the delay in publication of NATURAL HISTORY allows us to present). This resolution will have an important bearing on the national aspect of the redwoods question:

Resolved, That the Secretary of the Interior be, and is hereby, directed to investigate and report to the House of Representatives as to the suitability, location, cost, if any, and advisability of securing a tract or tracts of land in the State of California containing a stand of typical redwood trees of the species *Sequoia sempervirens* with a view that such land be set apart and dedicated as a national park for the benefit and enjoyment of the people of the United States and for the purpose of preserving such trees from destruction and extinction, and also as to whether or not the whole or any part of such lands or the purchase price thereof would be donated to the United States, and the probable cost of maintaining such lands as a part of the national park system.

Change of Personnel in the Forest Service

The people of the United States give grateful commendation for achievement to Colonel Henry S. Graves, and cordial greetings to Colonel W. B. Greeley, who succeeds him as Chief Forester

VARIOUS difficulties attending work in science in government positions compared with that in private and commercial positions, added to the low remuneration in government service, is depleting the scientific staff at the United States Capitol. Among those who have resigned is Colonel Henry S. Graves, who has held the position of Chief Forester for ten years. The following paragraph, which states frankly an underlying cause of his resignation, is quoted[1] from his letter to the Secretary of Agriculture:

Since the pecuniary returns afforded professional and scientific men in the government service inadequately provide against exhaustion of the working powers which must inevitably take place in time, and entail sacrifices from which employment elsewhere is free, the only course consistent alike with self-respect and a regard for the public interests seems to me to be retirement from office before efficiency has been impaired. Present conditions, which amount to a heavy reduction in the rate of compensation in practically every branch of the government service, emphasize this point of view.

Secretary Meredith accepted the retirement in a letter of appreciation from which extracts are here given:

My dear Colonel Graves:

Your decision that you cannot, in justice to yourself, continue longer at the head of the Forest Service is one which I have received with the deepest regret. I am compelled to accept it much against my inclination, because I cannot, in fairness to you, do otherwise. The loss of your services, however, is a matter of great moment to the Department of Agriculture, as well as to the public interests which you have so effectively protected and advanced . . .

The decade through which you have guided the Forest Service has been notable in accomplishment . . . More and more you have made the National Forests serve the public welfare . . . You have seen to it that they are utilized in helping the home builder, in promoting local prosperity, and in contributing largely to the benefit of the people as a whole. Thus you have given stability and permanence to the public forest enterprise—which means true development as against destructive exploitation.

You have put the handling of the public forests on a thoroughly business-like basis from every standpoint. Under severe handicaps and discouragements of a kind unknown in private business, you have secured an admirably trained personnel, developed a system of administration which I believe to be unsurpassed in effectiveness in any branch of the Government . . . At the same time, you have recognized that the work must be based on technical knowledge—that the public welfare must be served by

[1] Through courtesy of AMERICAN FORESTRY.

experts and specialists, just as private business is . . . You have, therefore, emphasized the importance of scientific research and of the application of its results in the business of administration.

You have also carried to substantial completion a great work of land classification . . . so that large areas, in the aggregate, of agricultural lands have been opened to acquisition and conversion into farms, while the lands suited to permanent public ownership and administration for forest purposes have been classified as such . . .

On your initiative primarily a policy of road building for the development of the National Forests and the benefit of the public has been entered upon. During the war you not only brought your organization through intact and enabled the National Forests to contribute up to capacity to the war effort of the country, but you employed it extensively in the location of forest supplies of war materials and in the solution of important research problems relating to wartime uses of forest products . . . Within the last few months you have taken the lead in a movement which I believe to be of the utmost importance, for extending the practice of forestry to lands now privately owned . . .

These are large services. By wise judgment, energy, vision, and untiring devotion you have rendered them to a degree that has been and is the pride of all your friends. They entitle you to a large measure of gratitude from the public, to whom they have been rendered, and you may justly be proud of the record you have made . . .

(Signed) E. T. MEREDITH
Secretary of Agriculture

Colonel Henry S. Graves, Chief Forester of the United States, retiring May 1, 1920, after a decade of government service. He has used his influence that the forests, while remaining forests, should be utilized in promoting local prosperity and the good of the people as a whole

The successor appointed is Colonel W. B. Greeley, assistant forester in the government service in charge of the departments of silviculture and research. To him the scientific men of the country give greeting and offer cordial coöperation, where that is possible and desired, in the high work of his office. Colonel Greeley was educated at the University of California and at Yale Forest School, and entered the United States Forest Service in 1904. He had charge of the American Expeditionary forestry forces in France during the war after Colonel Graves had spent two months in France in preliminary inspection of conditions and formation of plans for equipment and organization. This work put Colonel Greeley in charge of 21,000 forestry troops and 95 sawmills. In his work in field forestry in America he showed notable executive ability in the years when he was district forester in charge of the national forests of Montana and northern Idaho—a total area of 29,000,000 acres.

Colonel W. B. Greeley, successor to Colonel Graves, was in charge of the American Expeditionary forestry forces during the World War

What the Blind Are Doing

By WALTER G. HOLMES

President and Manager of the *Matilda Ziegler Magazine for the Blind*

THE scarcity and high price of labor seem to have given the blind their opportunity to show what they can do to fill this need, and right well they seem to be doing it. From every section come reports of blind workers, both men and women, who are doing successfully various lines of work in factories right along with the sighted worker.

The blind do especially well the assembling of small parts of all kinds of machinery, and if the managers of all big plants would only do so, they could give work to many blind that would prove lucrative both to the employer and the worker. Dr. Schuyler B. Wheeler, of the Crocker-Wheeler Co., has twenty-five or more blind employed in that big armature works. In Chicago, a number are doing all the reed work in a factory making gocarts; one of these men, totally blind, is earning forty dollars a week and another more than thirty dollars.

A candy factory in New York employs fifteen blind girls who pack and wrap the candy. It is interesting to see the speed with which they move their white-gloved hands when at work. Many, of course, do not attain the speed of the sighted workers but the blind worker is not turned from his work so much by abstractions seen by the sighted worker, and hence at the end of the day often has done as much as the one with good eyes. A number of blind are finding work as dictaphone operators, many acquiring the speed and accuracy of the sighted typist.

And what are the blinded soldiers doing? From Evergreen, the Red Cross Institute for the Blind at Baltimore, they are being turned out into various lines of work—life insurance, real estate, massage, and several are in charge of stores,—two are running their own grocery stores, two their musical instrument stores, and others are preparing to engage in similar work in their home towns.

The embossing of books in revised Braille, the new uniform type for the blind in this country, is receiving an impetus, and many leading authors are supplying the money for embossing the plates of their latest stories. "The Daughters of Ohio in New York" raised the money for one book which has just been published. It costs from $300 to $500 to emboss the plates in brass for an ordinary-sized book. Any one who wants a lasting monument, "as lasting as brass," could give pleasure to thousands of blind if he would supply the plates for some additional book, for the blind have so little literature and do so crave to read what the sighted world is reading. When these plates are made they last for all time, and editions can be printed from them as needed; the libraries pay for the printing and binding, and the Government sends them free of postage to and from the blind reader in his home.

Courtesy of Outlook for the Blind

Blind men at work in a Chicago factory, giving wholly satisfactory results and earning from $15 to $40 a week

A State Should Protect Its Antiquities

THERE has been given all too little attention in the United States to the protection of aboriginal documents. Especially is this true in the West and Southwest, although some years ago New Mexico and North Dakota followed the early example of Ohio, and passed protective laws. Ohio not only passed protective legislation many years ago, but also adopted the policy of establishing state parks about some of its most famous earthworks. Two remarkable ruins, Fort Ancient and Great Serpent Mound, were preserved in this way. In very recent years state legislation covering antiquities has been enacted in two additional states, Alabama and Arkansas.

Dr. Thomas M. Owen, director of the department of archives and history of the state of Alabama, now calls attention to an act of the state legislature of 1915. This law makes archæological exploration within the state *without formal permission from the state government* an offense punishable by heavy fine. The restriction certainly seems adapted to the prevention of loss to civilization of valuable historical data, and is worth study by states not possessing such legislation. It says, in part:

"That the State of Alabama reserves to itself the exclusive right and privilege of exploring, excavating or surveying, through its authorized officers, agents or employees, all aboriginal and other antiquities, mounds, earthworks, ancient or historic forts, and burial sites within the State of Alabama, subject to the rights of the owner of the land upon which such antiquities are situated, for agricultural, domestic or industrial purposes; and that the ownership of the State is hereby expressly declared in any and all objects whatever which may be found or located therein." [1]

Dr. Owen emphasizes, however, that for legitimate scientific investigation the law is not intended to be "exclusive or prohibitive," but merely to defend the state's aboriginal treasures against the unqualified—"those people who would desecrate and destroy them for commercial purposes," leaving no records for history.

The protective law in Alabama was brought about through the activities of the Alabama Anthropological Society, which was the pioneer in such work in the South. For fifteen years this organization has been collecting implements showing the handiwork of aboriginal man in that section of America and depositing them for safe keeping in the department of archives and history. It has also recorded and mapped practically all of the ancient town sites within the state's boundaries.

[1] From Alabama General Laws (1915), pp. 729–30.

Indian Music

THAT Indian music is apt to produce in our minds a sense of the grotesque is probably due in large part to its lack of implied harmonies. For an instant we may feel that simple harmony is implied, but in the next this is contradicted.

When Indian music is sung by a number of people, they all sing the air. Sometimes the octave is introduced, but there is no harmony such as our contralto, tenor, and bass parts. Our harmony creates nothing but confusion in the minds of primitive peoples, and our singing they consider barbarous.

When for the first time we hear a piece of Indian music reproduced by the phonograph, the inclination to laugh is very likely almost irresistible. It usually strikes us as being a ridiculous performance intended to make us laugh. It is certainly different from anything we have ever heard, and we may like it in a way, and be ready to hear it repeated; but the idea that it is music probably does not occur to us.

The fact is that primitive Indian music is not our music, and cannot be written out correctly in the modern form of notation. The best that can be done with many of the tones is to place them on the line or space of the staff representing the note they approach nearest in pitch. Suppose the note we are taking from the Indians' voices or phonographic record is sharper than E yet nearer to it than to F, there is no other way than to write it E, and so on with the other tones. It is easy to see that a song so written will not be satisfactory when played on the piano. The factor that adds most to

the strangeness of much primitive music is the difference in musical scales. As everybody knows, we divide the octave into twelve tones which form the diatonic scale, or as it is often called, the piano scale. Now most primitive peoples use the pentatonic or five-tone scale. This difference in the division of the octave makes primitive music sound all out of tune.

The pentatonic scale is so widespread among primitive peoples that it must be considered the natural one in the earlier stages of musical development. It was in use in China, in 300 B.C., and probably much earlier. "The fact that most of the Chinese native airs are founded on the pentatonic scale accounts for the difficulty the grown up Chinese have in singing our Western tunes that have semitones. While they sing perfectly such tunes as 'Auld Lang Syne,' . . . 'Ye Banks and Braes,' . . . 'Happy Land' and 'Jesus Loves Me,' which . . . contain no semitones, they cannot possibly sing correctly 'Old Hundred,' which seems so simple to our ears, because it has a semitone in each line."[1] If the singer of primitive songs finds our diatonic scale difficult or impossible and considers our music barbarous, is it any wonder that music in his five-tone scale sounds badly out of tune to us?

It seems to be a popular belief that the world is losing a vast amount of good music through the neglect of modern composers to use Indian tunes, or parts of them, as motives in their symphonies and other compositions. It is probable, however, that the world is no poorer for this neglect for, as has been stated, primitive music that has not been influenced by contact with the white man is not music, at least not good music, to our ears.

I grant that it might furnish the inspiration for music, just as a handful of differently colored shell beads, or a thousand and one primitive objects in the American Museum are now furnishing artists with inspiration for beautiful designs for the decoration of silks and other textiles. I will go so far as to say that a piece of Indian music in which the singing and drumming are in two different rhythms might furnish the composer with an inspiration; like the design artist, however, he must not copy, but produce something that shall remotely, if at all, resemble the thing that inspired it.

It may be said that a number of valiant attempts have been made by enthusiastic American musicians to use Indian folk songs as material for artistic music that should be purely American. The material has invariably proved refractory even in the hands of skillful composers. It has always turned out that the process of artistic elaboration robs the songs of their original quality.

Although Indian music, as music, has no very great value to us, it can certainly furnish very important data for the ethnologist. "It seems that music offers one of the very best trait-complexes for the study of diffusion and invention. It is one of the weak points in the careful, painstaking study of ritualism now prosecuted by American anthropologists, for when a ritual passes from one tribe to another (of which phenomenon we have already many instances) we may expect that its music will be carried more faithfully than anything else."[2]

It is a very common mistake to suppose that Indian music is largely in a minor key. Travelers and novelists almost invariably tell us of primitive peoples "singing a sad song in the minor key." I once asked one of these travelers why he had said the music he had heard was in minor. His answer showed that he thought all primitive music in a minor key. As a matter of fact it seems that at least 65 per cent of recorded Indian music is in a major key. In many songs the tones are in such melodic sequence that it cannot definitely be said they belong to either key.

Music plays a very important part in Indian life. It is incorporated in the rituals, every ceremony has its particular songs; certain ones are for the warrior, others to be sung in times of danger or necessity; the medicine man has his songs used while healing the sick; the lover his which he sings to the girl of his choice. In fact every phase of Indian life is expressed in music.

The enjoyment of music depends principally on beauty of form, emotion, and association. The Indian thinks his music beautiful, and as it is so intimately connected with his traditions and everyday life there is no lack of association.

[1] From a paper by Mrs. Timothy Richard on "Chinese Music," read before the China Branch of the Royal Asiatic Society in 1898.

[2] Quoted from *The American Indian*, by Clark Wissler, pp. 147–148.

Indian music heard in the wilds, in connection with the ceremonies of which it forms a part, is appropriate and all that could be desired, but when removed from its natural setting and judged by modern musical standards it is found wanting.—CHARLES W. MEAD, Assistant Curator of Anthropology, American Museum.

Galleries for Fine Arts and Industrial Arts

THE large number of persons interested in the crafts and the graphic and industrial arts will rejoice to know that these arts have in prospect an adequate building for work and display in New York City. A campaign to raise $250,000 for such purpose was inaugurated recently by Mr. Cass Gilbert, president of the National Institute of Arts and Letters, and other prominent artists, at a dinner at the Hotel Pennsylvania, and met at once with cordial response. The following letter from the president of the National Academy Association removes any confusion there may have existed in the minds of our readers concerning the aims of the various "Fine Arts" organizations on the one hand and societies of the "Industrial Arts" on the other.

To the Editor of NATURAL HISTORY:

Replying to your inquiry regarding the relation of the scheme for the coöperative art building which was launched recently at the Hotel Pennsylvania, New York City, to the plans of the National Academy Association which has for its purpose the erection of a Fine Arts Building for the city of New York, I would say that they do not in the least conflict with each other. There are scores of concerns—societies, institutes, and associations, which are doing excellent work in this city along the lines of applied art. Many of these like the National Society of Craftsmen, Society of Jewelry Designers, and Pictorial Photographers of America, are industrial organizations. Personally all art appeals to me as existing on one and the same plane, but the distinction has been made between the "Fine Arts" and the "Industrial Arts."

These Industrial Art Societies are in immediate need of working quarters. They want a clearing house, employment bureau, sales galleries, and offices. They aim to discover talent and direct it into the channels for which it is most fitted. They have long worked on these lines in hired quarters scattered through the city. It is time that they should have a building of their own, which they can occupy continuously. Six societies have coöperated in this movement with good prospects of success.

A Fine Arts Building, such as the Academy hopes for, would be primarily for the exhibition of painting, sculpture, architectural designs, and engravings. It would also afford opportunities for the exhibition of the products of applied art—for the Academy stands for the encouragement of arts in general. It would also furnish permanent quarters for certain organizations, mostly the larger exhibiting societies now in the membership of the association. But it could not possibly house and give working space to all the societies engaged in the many branches of applied art.

If the Fine Arts Building eventuates, the Academy Association will look to these industrial art bodies for exhibits in their special lines. These lines are parallel to, and do not conflict with, those of the Academy, which gladly welcomes the new union of these industrial art societies and wishes them success.

(Signed) HOWARD RUSSELL BUTLER
President, National Academy Association

"Nature and Science on the Pacific Coast" [1]

A book so charming, authoritative, and valuable for the region it covers that it is an example for similar local volumes in other parts of America

THIS handbook may well be taken as a model for others, not only because of the importance of its information and the interesting way in which it is imparted, but because of its attractive make-up and convenient size.

Prepared under the auspices of the Pacific Coast Committee of the American Associa-

[1] *Nature and Science on the Pacific Coast.* A guide book for scientific travelers in the West. Edited under the auspices of the Pacific Coast Committee of the American Association for the Advancement of Science. Illustrated with nineteen text figures, twenty-nine half-tone plates, and fourteen maps. Paul Elder and Company, San Francisco.

tion for the Advancement of Science, for use by the members of that Association and for scientific travelers at the time of the Panama-Pacific Exposition, it may be recommended to all who desire accurate information regarding the most important and most interesting features of that region. The articles are by men who are authorities on the topics of which they treat, and starting with "The Approaches to the Pacific Coast" by Dr. Frederick J. Teggart, they end with a chapter by Dr. A. O. Leuschner on "Scenic Excursions." In between are chapters on the Spanish settlements, the Panama Canal, weather conditions, vertebrate fauna, forests, observatories, and museums. Dr. J. C. Branner writes of earthquakes, Dr. Jordan of the fishes, Dr. Kofoid of ocean life in general, while literary landmarks are discussed by Professor Seward, and legal and political development by Professor McMurray. The beasts and fishes as well as the insects and the teeming invertebrate life of the sea are all described, and Dr. J. C. Merriam gives us a glimpse of the life of past geologic ages.

Professor Vernon L. Kellogg, who writes of the insects, also contributes a brief account of Luther Burbank and his work, in which he tells of some of the things which Burbank has really done and of some he has not.

The articles themselves, or many of them at least, are literature, but really the book must be read to be appreciated, and this brief review is merely to call the attention of prospective tourists to the fact that they should prepare for a visit to the Pacific Coast by reading this book. It will surprise many to learn that the project of the Panama Canal was seriously considered as early as 1530, and one can but admire the courage of those early engineers whose sole reliance was upon picks, shovels, and man power. It will also be a surprise to learn that the oft mentioned Kuroshiwo Current plays no part in creating the mild temperature of the Pacific Coast region, but that this is really due to the westerly winds.—F. A. Lucas, Director, American Museum of Natural History.

Notes

Dr. William H. Maxwell, superintendent emeritus of New York City's public schools, died on May 3, at the age of sixty-eight. Dr. Maxwell had served the city as superintendent for thirty-five years when the emeritus position was especially created for him.

The following letter by his successor, Mr. William L. Ettinger, was brought formally to the attention of the Board of Education and was later read in all the schools throughout the city:

"His was the master mind in the reorganization of the school system, made possible by the enactment of the charter; in the establishment of the merit system as a substitute for advancement by political preferment; in the development of our high school system, and in the protracted but successful struggle to enrich the elementary curriculum in order that our children, rich and poor, might enjoy the benefits of a liberal education. His was the task and the privilege to interpret the best educational thought of the time and through his energy and leadership to embody such ideals in the daily work of our school system. Dr. Maxwell's death is an irreparable loss not only to our city, but to education throughout the nation."

The United States Supreme Court has dismissed the injunction proceedings brought by the state of Missouri to restrain the United States game warden from enforcing in that state the treaty between the United States and Great Britain for the protection of migratory birds and the act which carried out the provisions of this treaty. The plaintiff maintained that the statute unduly interfered with the rights of the state, reserved under the Tenth Amendment, and interfered with the sovereignty of the state and the property rights of its citizens. The court held that inasmuch as the birds were only transitorily within the state and could be protected only by international action, the treaty and act were within the sphere of federal enactment. "Here national interest of very nearly the first magnitude is involved," said Justice Holmes in rendering the majority opinion. "It is not sufficient to rely upon the states." . . . "We see nothing in the Constitution that compels the Government to sit by while a food supply is cut off and the protectors of our forests and our crops are destroyed."

Courtesy of Zoölogical Society Bulletin

The Battery, New York, in 1824, showing "Castle Garden," our present New York Aquarium building. Reproduced from an old drawing by Imbert, which represents the landing of General Lafayette at Castle Garden in August of 1824. The tower at the extreme right is referred to in the writings of Washington Irving as "the churn." It appears in only the very old views of the Battery

THE March number of the *Zoölogical Society Bulletin* is devoted to an account of the interesting history of the New York Aquarium building, and reproduces a large number of quaint and valuable old paintings and prints. The building in Battery Park is one of the oldest surviving structures in New York City. It was constructed between 1807 and 1811 for a fort and served in this capacity until 1823, being known first as the Southwest Battery and later as Fort Clinton. After the fort was dismantled the city turned the building into an amphitheater called Castle Garden, and as such it served for many notable historic occasions. Lafayette, Kossuth, and the Prince of Wales were received here; Jenny Lind here made her American début; and from its platform Professor Morse demonstrated his discovery of the telegraph. In 1855 the place was made an emigrant station, but still carried its old name until the Aquarium took it over in 1896. When first built the fort stood a hundred yards from the shore, for the present sea wall was only finished about 1870. The earliest and one of the best pictures of it is preserved in the design of an eighteen-inch blue platter dated 1815. The story is fascinating history. But the public need today calls emphatically for a large modern structure comparable in beauty of architecture and in equipment with the great aquarium at Naples and the new building under construction in San Francisco. The citizens of New York City are proud of the history of the old Fort Clinton and Castle Garden down at Battery Park, but are not proud of the building which houses their Aquarium today.

IT is reported by Dr. Stephen T. Mather, director of national parks, that for the two years preceding 1919 about fifty-five thousand cars of private automobilists traveled the parks annually, while in 1919 there were more than one hundred thousand. The total number of visitors to all the national parks by all methods of travel exceeded three quarters of a million. Yosemite, especially, gave pleasure to multitudes during the summer of 1919, and an unusually large number sought the higher altitudes. The hotel problem here has finally been solved by the Yosemite National Park Company, representing the business interests of Los Angeles and San Francisco. Improvements at an aggregate expenditure of $1,500,000 are being installed which will invite both winter and summer travel to this great scenic playground of America. One imperative need, not only in Yosemite but also in various other national parks, is that remote sections be made accessible by new trails and public camps.

THE man who tours the West in 1920 and wishes to visit the United States national parks is to be congratulated that there is

comprehensive and up-to-date information at hand. *The Book of the National Parks*[1] is recommended not only for its photographs, its accurate accounts and maps, but especially for the enthusiasm and joy in it. All Californians, however, and most American men of science, will take exception to the author's lack of appreciation of the value of John Muir's Sierra investigations.

As announced in *Science*, the second series of the Le Conte Memorial lectures will be given in the Yosemite National Park during the months of June and July, 1920. These lectures were instituted in honor of the naturalist and geologist, Joseph Le Conte, who for thirty years was a member of the faculty of the University of California. This year the speakers and subjects will be as follows: Dr. John C. Merriam, "The philosophy of Joseph Le Conte"; Dr. A. C. Lawson, "The geological history of the Sierra Nevada"; Dr. Joseph Grinnell, "The vertebrate animals of the Yosemite"; Dr. C. Hart Merriam, "Indian tribes formerly in Yosemite."

Mountain-lovers who search out the scenes that John Muir loved may now scale Half Dome, of Yosemite Valley, with comfort and safety. The Sierra Club, through the generosity of Mr. M. H. McAllister, has completed a zigzag trail and stone stairway which covers the first six hundred feet of the slope, and erected a double handrail of steel cables over the last eight hundred feet. Safety belts, fastened to the cables, are provided for those who desire them or have neglected to bring rubber-soled shoes, for this second section of the trail is composed of smooth, polished granite.

If the higher Sierra Nevada, accessible only to the traveler on horse back, are to be utilized for a public playground, it is necessary that the very limited grass supply be protected from cattle. Grass for fodder is found on only a few scattered meadows in the Sierra and in very limited amount. Even with a pack mule the traveler cannot carry sufficient supplies for a long trip, but must rely on finding enough grass for his horse. Cattle are grazing now on public lands up the very slope of Mt. Whitney.

The Twentieth International Congress of Americanists which was to meet at Rio de Janeiro in June of this year has been indefinitely postponed because of the unsettled state of Europe which will prevent many Continental anthropologists from attending. The next Congress will probably be held in 1922.

Mr. Louis R. Sullivan, assistant curator of anthropology at the American Museum, left on April 27 for the Hawaiian Islands where he will make an investigation of the origin and migration of the Polynesian race. His work will be done in connection with the Bishop Museum of Honolulu, and will mean a year's study of the skeleton collections and living representatives of the native Hawaiian population. Mr. Sullivan will bring back photographs and plaster casts for a new exhibit in the South Sea hall of the American Museum.

The investigation of the rapidly vanishing Polynesian race of the Pacific is provided for by a gift to Yale University of $40,000 from Mr. Bayard Dominick, of New York City. This fund will be disbursed through the Bishop Museum of Honolulu, and the expedition will be in charge of Professor Herbert E. Gregory, of Yale. Present plans call for a two-years' study by parties composed of an ethnologist, an archæologist, a botanist, interpreters, and assistants.

Professor Wilhelm Pfeffer, one of the pioneers in plant physiology, died in Leipzig on January 31. He was called in 1887 to the University at Leipzig, where later many European and American botanists resorted to his laboratory and lectures. His *Handbook of Plant Physiology* has been the standard reference work in that subject for two generations.

Dr. William T. Sedgwick, professor of biology at the Massachusetts Institute of Technology, has been appointed the first exchange professor from the Institute to the universities of Leeds and Cambridge, England.

At the meeting held in Rome on March 29, 1920, Professor Henry Fairfield Osborn was elected an Honorary Member of the Societa Romana di Antropologia.

Mr. Gifford Pinchot, formerly chief forester of the United States, has been ap-

[1] *The Book of the National Parks.* By Robert Sterling Yard. Charles Scribner's Sons, New York, 1919. Maps and illustrations, pp. 420.

pointed commissioner of forests of the state of Pennsylvania.

THE Honorable Eugene A. Philbin, Justice of the Supreme Court of New York County, who died in March of this year, will be especially remembered in the metropolis as a founder and the first president of the Parks and Playgrounds Association through which he has materially assisted in the development of the city's parks and forestalled attempts at various forms of park exploitation that were constantly proposed.

DURING the summer of 1919 the death was announced of two of Germany's greatest scientists, Ernst Haeckel and Emil Fischer.

ERNST HAECKEL, who died at the age of eighty-seven, was one of the most widely known zöologists of the last century both by reason of his special contributions to the science of zoölogy, and through his popular writings, some of which reached a phenomenal sale. Haeckel entered the study of zoölogy by the route, at that time not uncommon, of the medical profession, studying under the famous Virchow and Johannes Müller. After a very brief practice of medicine he attached himself as a zoölogist to the University of Jena, which has always been the most free of the German universities, and in spite of other offers remained there until his death. During the latter half of the nineteenth century when Darwinism was agitating not only zoölogical but also religious and philosophical circles, Haeckel came out as a champion of the new evolution, and his greatest technical works were contributions to this controversy. He was an admirable artist and illustrated with his own drawings not only his monographs, but his travels as well. Since the opening of the present century Haeckel turned his attention to the propaganda of a philosophy of monism which he championed as a new religion. He took an aggressive and bitter attitude on the question of the World War and in 1916 brought out a book on this subject under the title *Eternity*.

EMIL FISCHER, professor of chemistry in the University of Berlin and among the greatest organic chemists of all time, was but sixty-seven years of age at the time of his death. Fischer was trained principally by Adolf von Baeyer, whom he survived only a year, and after a varied academic career as assistant and *Privatdocent* he was called to the chair of chemistry in Erlangen and then in 1892 to Berlin. His most conspicuous investigations were in the syntheses of the sugars, the purines, and the proteins, researches which have had an immeasurable effect in other biological sciences. In 1902 Fischer was awarded the Nobel Prize in chemistry.

Peoples of the Philippines,[1] by Dr. A. L. Kroeber, professor of anthropology in the University of California, is the fourth of a series of handbooks, issued by the American Museum, which deal with primitive races and interpret the ethnological collections exhibited. The historical development of civilization is unusually well illustrated in the Philippines where the various cultural layers are readily traceable. Three varieties of man—exclusive of recent European and Chinese immigrants—are found on the islands and represent three cultural stages. These are the Negritos, an indigenous, primitive, dwarf Negroid race which still survives in the mountainous districts and on some of the smaller islands, but whose original culture and language have completely disappeared; the Indonesians, a rude oceanic people from southern Asia; and the Malaysians who brought over something of Hindu civilization. Today nearly nine-tenths of the Filipinos are westernized, but many of the old customs survive in the social fabric and there are still some remnants of the earlier cultures in remote corners. Professor Kroeber includes many text figures of human types and of artifacts, and six maps to elucidate racial distribution.

THE American Forestry Association desires to register each memorial tree planted in the United States for the country's soldier dead, and will send a certificate to the person who reports to the association the planting of the memorial. The most unique project so far reported is that undertaken by the Women's Auxiliary of the Chamber of Commerce at Macon, Georgia. Memorial trees are to be planted on two roads which connect four towns, so that the trees form a cross with its center near Macon.

THE school children of Jerusalem planted 500 trees on the Jewish Arbor Day in

[1] *Peoples of the Philippines*. By A. L. Kroeber. Handbook Series No. 8, American Museum of Natural History, New York, 1919.

furtherance of the plan of the Zionists to replace the forests destroyed through Turkish misrule and the necessities of the war. During the past year 369,000 trees have been planted in Palestine.

A MOVEMENT to reforest the denuded hills of China through the establishment of a national Arbor Day has been started by the College of Agriculture and Forestry at Nanking, according to a note in the *American Journal of Forestry*. Requests have been sent to all the schools in the country, native and foreign, urging the establishment of this holiday. Seeds will be supplied by the Forestry College.

AN important step has been taken toward the development of the many thousands of acres of forest land on Long Island, New York, through the establishment of two fire observation stations near Selden and at Flanders by the State Conservation Commission. The only trees at present growing over large areas on the island are oaks and pitch pine, although white pine and Norway spruce can be grown if given fire protection. The plan advocated by State Forester B. H. Paul in the *Conservationist* is for the development of municipal and county forests which, when properly protected, should give profitable returns in the form of posts, poles, and cord wood.

Courtesy of American Forestry

A "victory oak" on a school lawn, planted in memory of our American soldiers

ABOUT eight thousand boys and girls of Baltimore celebrated Arbor Day, April 9, by tree-planting ceremonies in the public parks. The trees will grow up with the children and always hold pleasant personal memories.

Two thirds of every tree cut is wasted, according to Dr. C. P. Winslow, director of the United States Products Laboratory, in an address before the Madison Section of the Society of American Foresters.[1] A large part of this waste is unnecessary, and it is the aim of the Forest Products Laboratory to bring about its elimination. One way in which the lumbering residue may be employed is in the manufacture of "built-up" wood, made by gluing small pieces together. Greater utilization can also be made of wood waste for chemical by-products and paper pulp, fields of work that are still open for further research.

THE significance of the practically contemporaneous evolution of the warm-blooded animals and the flowering plants is discussed by Dr. Edward W. Berry, professor of palæontology in Johns Hopkins University, in a recent number of the *American Journal of Science*. The flowering plants are characteristically fruit or seed bearers and aside from the development of these sources of food we cannot conceive of the appearance of birds and mammals in any numbers. The great differentiation and distribution of these animals in the comparatively short Cenozoic era is one of the most profound events in the animal evolutionary series. That this sudden efflorescence was closely associated with the appearance of the higher plants cannot be doubted. The small Triassic Prototherian predecessors of the mammals did not change greatly during a long lapse of time before the Cenozoic because of an unchanging food supply for which they had to compete with the dominant giant reptiles. The modification of

[1] *American Journal of Forestry*, Vol. XXVI, 1920, p. 254.

this food supply through the appearance of the flowering plants was perhaps one of the factors which not only favored the evolution of the higher mammals, but also "spelled the doom of the overgrown and specialized Reptilia of the Mesozoic."

DR. W. H. R. RIVERS, the eminent ethnologist of Cambridge University, England, was the guest of honor at a luncheon given by the Galton Society in March, while his colleague, Dr. G. Elliot Smith, of the University of London, was the guest of honor at another luncheon of the Society on May 5. Dr. Rivers and Dr. Smith are well known to American anthropologists, especially in connection with their contention that many of the burial customs and other cultural elements of ancient Egypt were carried far to the eastward by traders and in the search for gold and pearls, until they finally spread to distant localities in the South Seas and even to the eastern coasts of South America. Dr. Smith's researches in Egyptology grew out of his interest in the morphology of the cranium and brain of certain Egyptian mummies, which he studied while stationed at Cairo.

DR. JOSEPH GRINNELL, associate professor of zoölogy and director of the University of California Museum of Vertebrate Zoölogy, has presented his collection of skins of North American birds to the University of California. This gift contains 8312 specimens collected between 1893 and 1907.

DR. JOHN H. FINLEY has recently been chosen to head the Committee of Roosevelt Clubs in Schools and Colleges.

DR. NATHANIEL L. BRITTON, director of the New York Botanical Garden, has returned from a botanical expedition to Trinidad.

THE State Conservation Commission of New York has furnished the post office at Albany with a stamp cancellation machine bearing the words, "Prevent Forest Fires. Protect Wild Life," and all mail passing through that post office is so cancelled. It is significant for the future beauty and wealth of the state that private landowners have been buying many thousands (at from $2 to $5 a thousand) of young Norway spruce, white, red, and Scotch pines, and Carolina poplar from the Commission for the reforesting of idle lands.

TO encourage the artificial propagation of fur-bearing animals the New York Conservation Commission has waived the requirement of a bond of $500 hitherto necessary. The Commission hopes that this will make it possible for people of small means to raise these animals, as there has been a great drain on the wild stock on account of high fur prices. The breeder's license of $5 is still required except for the raising of foxes, which are not protected in New York.

IT has been suggested that a possible solution, in small part at least, of the question as to where our common house fly (*Musca domestica*) spends the winter months is presented by the discovery of its larvæ in snails. Although extensive search has been made for the whereabouts during the winter of this most common pest, it has so far eluded detection. M. E. Séguy, of Rambouillet, France, is quoted in *Parasitology* as having discovered that the fly larvæ quickly destroy living snails, burrowing through the epiphragm and penetrating to the foot in the course of eight hours. In the middle of January M. Séguy collected fifty snails from a wall and placed them in jars at 25°C. Nine of the mollusks yielded numerous fly larvæ.

PROFESSOR THOMAS L. HANKINSON, of the Eastern Illinois State Normal School, has accepted the position of ichthyologist in the Roosevelt Wild Life Experiment Station at the New York State College of Forestry. Professor Hankinson has been engaged for seventeen years in the study of the fish of Michigan and Illinois and for five years has coöperated with Dr. C. C. Adams in the Oneida Lake and Palisades Interstate Park ecological surveys.

THE scientific problems of the Pacific Ocean region will be outlined at a conference, to be held in Honolulu in August, of scientists and scientific institutions whose interests lie in and about the Pacific. The conference will be held under the auspices of the Pan-Pacific Union and the program will be arranged by the Committee on Pacific Exploration, of the National Research Council.

THE first really adequate geological map of Brazil is issued by Dr. John Casper Branner, President Emeritus of Leland Stanford Junior University, together with an outline of the geology of that country and extensive bibliographies.[1] This work, begun by Dr. Branner in 1874 and covering a considerable portion of his lifetime, stands a monument to his genius and industry. In addition to the author's own geological researches in Brazil, extending into all but two of the states, he has brought together not only all the published data but a large amount of information obtained from friends and acquaintances who had personal knowledge of various parts of the country. The map is on a scale 1:5,000,000, and thirteen subdivisions of the geologic column are represented. The outlines accompanying the map consist of an account of the stratigraphic geology of the country and of the general and economic geology by states.

LEAD poisoning in waterfowl as a result of swallowing shot which had accumulated from year to year in the mud about shooting stations has been investigated by Mr. Alexander Wetmore of the Department of Agriculture. Mr. Wetmore found by experiment on wild mallards at Bear River, Utah, that six pellets of No. 6 shot were always fatal and even as few as two might prove so. The symptoms of lead poisoning were partial paralysis, loss of flesh, and recurring spasms. An examination of the mud bottoms with an ordinary small sieve, within range of favorite blinds, revealed great quantities of shot which the ducks might easily swallow, as they have a tendency to take any small, hard object. What may be the effect on the actual mortality among wild fowl, however, cannot be determined.

THE absolute protection of seals has been extended by the government of New Zealand for the coming three years over all territory under its jurisdiction, and the exploitation of Macquarie Island has been denied by the government of Tasmania to the company which so mercilessly destroyed the wild life there. This eleventh-hour protection may yet save the seals, sea lions, sea elephants, penguins, and various sea fowl of this Antarctic island. Macquarie Island is the largest of a small group off the southern coast of New Zealand and was formerly a good hunting ground. The Australasian-Antarctic Expedition (1911–14) made its headquarters here, and at present a permanent weather and relief station is maintained on the island. It is possible that the island may be converted into a wild life sanctuary and used for a biological and meteorological station.

THE State of California Fish and Game Commission has issued a *Bulletin* which describes the spawning habits of a California silverside (*Leuresthes*). From March to June these little fishes bury their eggs in the sand of the ocean beach close to the high-tide line. These eggs are buried when the tides are highest and therefore remain above the reach of the water for a period of two weeks, at the end of which time their development is completed and they hatch on being washed out of the sand again. It seems that the action of the waves near high-water mark with the turning tide alternately cuts away and then refills the sand, and the time and place at which the fishes bury their eggs are delicately adjusted to this phenomenon, so that the eggs are situated during their incubation period farther below the surface of the sand than the fish would naturally bury them, and two weeks later are washed out mechanically by the high tide, whereupon they immediately hatch. The very existence of the species is dependent on delicate adjustment to one slight natural phenomenon.

A NEW horse mackerel (*Thunnus allisoni*) has been described by Mr. Louis L. Mowbray, of the Miami Aquarium, Florida. Three specimens were taken, one of which is 5 feet, 9 inches in length and 143 pounds in weight. This fish is closely related to a Japanese species. Other relatives are the "albacore" and the "tuna" of the Pacific, the former being extensively used in California canneries. The "tunny" of the Mediterranean fisheries is the largest bony fish known, and attains a weight of fifteen hundred pounds.

The new aquarium at Miami has been erected through the interest and generosity

[1] "Outlines of the Geology of Brazil to Accompany the Geologic Map of Brazil," *Bull. Geol. Soc. America*. Vol. 30, pp. 189–338, Pls. 7 (colored map), 8–10. June 30, 1919.

of Mr. James A. Allison, of Indianapolis. It is equipped with forty-eight tanks and four pools and will be provided with a thirty-five-foot collecting power boat.

THE activities of scientific men in connection with the late war have resulted in a large volume of post bellum discussion with regard to organization and coöperation in scientific research. There is, for instance, a controversy between the protagonists of coöperation as against those who maintain that all productive scientific work of importance must be carried on by individual initiative. Dr. C. L. Shear, pathologist of the United States Department of Agriculture, in an article in the *Scientific Monthly* aims to reconcile these opposing views. Dr. Shear illustrates the necessity for coöperation by problems in plant pathology requiring the technical knowledge of pathologists, mycologists, entomologists, pomologists, and experts in refrigeration and marketing. The wide expert knowledge involved in such problems could not have been encompassed by a single individual, nor could it have been effectively partitioned among a number of scientists working independently, but it required the closest coöperation and mutual understanding. On the other hand, special problems not requiring too great a field of knowledge can be more effectively attacked by the individual working alone. But "Darwins and Edisons are rare. The future advancement of science must depend chiefly on the combined efforts of the mass of faithful seekers of truth whose names may never appear near the top of the scroll of honor of the world's greatest scientists." Both forms of research are required and there is plenty of scope for each.

THE all too numerous surgical contingencies of the world war have been the cause of many new departures and expansions among which are the successful experiments of Dr. Serge Voronoff in human grafting, described in a recent number of *La Revue*.[1] Four months after the war started Dr. Voronoff established a department of osseous grafting at the Russian Hospital in Bordeaux where he received a large number of patients suffering from lesions accompanied with loss of bone. It was determined that the transfer of bony tissue was most successful if made from the patient himself and for this purpose the fibula served well. This thin bone in the leg is vestigial in man and can be dispensed with. Grafts were sometimes cut from the tibia, especially for repairing the arm bones, or fragments of the fractured bone were employed. Use of bones from the recently dead was also found feasible up to eighteen hours after death. In the transplantation of bones of other animals to man Dr. Voronoff has had some success, but he has definitely shown that this method does not produce a true graft, the animal bone merely serving as a scaffold for the growth of new human tissue. Such operations cannot ordinarily be performed until several months after the original wound has healed, as the tissues must be entirely healthy. The work now in hand as a result of the war is a task which, according to Dr. Voronoff, will consume ten years of continuous effort.

THE shortage of essential minerals in European industry has given prominence to the recently effected settlement of the political status of Spitsbergen with its mineral riches and future possibilities. Dr. R. N. Rudmose Brown, British Arctic and Antarctic explorer and medalist of the Royal Scottish Geographical Society, has lately published the first satisfactory account in English of this archipelago[2] which he has had opportunity to study personally. Dr. Brown gives an account of the physiography, geology, fauna, and flora, mineral wealth, and a detailed history ranging from the early whalers and trappers to the treaty of Brest-Litovsk between Germany and Soviet Russia in which these two governments agreed to the internationalization of this island. Twenty-two illustrations from photographs, mostly by Dr. W. S. Bruce, picture effectively the topography and life of Spitsbergen, while a map reproduced from the *Scottish Geographical Magazine* outlines approximately the principal mining claims of Britain, Norway, Sweden, and Russia.

THE Mineralogical Society of America was organized by a group of mineralogists

[1] *Cf.* May Tevis, "Human Grafting." *Scientific American Monthly*, Vol. I, 1920, p. 307.

[2] *Spitsbergen*, By R. N. Rudmose Brown. Published by J. B. Lippincott Company, Philadelphia; Seeley, Service & Co., Ltd., London, 1920.

from all parts of the United States and Canada at a meeting held at Harvard University on December 30. The *American Mineralogist* is to be the official organ of the society and will be enlarged to include research papers and abstracts. The following officers were elected: president, Dr. E. H. Kraus, of the University of Michigan; vice president, Dr. T. L. Walker, of the University of Toronto; secretary, Mr. H. P. Whitlock, of the American Museum of Natural History; treasurer, Dr. A. B. Peck, of the Bureau of Standards, Washington; editor, Dr. E. T. Wherry, of the Bureau of Chemistry.

Dr. Alfred J. Moses, professor of mineralogy in Columbia University, died on February 27 in his sixty-first year. Professor Moses was author of the standard American text on *Mineralogy, Crystallography, and Blowpipe Analysis* and his work on *The Characters of Crystals* (1899) was the first American treatise on physical crystallography, a subject that has since become of commanding importance. He received his doctorate from Columbia University in 1882 and has been connected with the institution since that time.

Upon the request of Dr. Gustave Straubenmüller, associate superintendent of schools, the departments of public education and of public health in the American Museum have entered upon an active coöperation in the campaign conducted by the city department of education against malnutrition among school children. Twenty traveling exhibits of food hygiene have been prepared for circulation in the schools, each exhibit including sixteen food models, a set of blocks which show the composition of certain common foods, and eight illustrated charts. The food models, which represent ordinary portions of lamb stew, oatmeal, spinach, tomato soup, and so on, have been designed with great care so that they may be used to illustrate the cost and calorie value of each food, and may be combined to form the breakfast, dinner, and supper of an ideal low cost dietary. The blocks illustrate the chief values of each food in specific food constituents. The charts present original data in regard to food composition and food values worked out by Miss Mary Greig, of the department of public health. The school exhibit was first shown to the public on the occasion of a lecture by Dr. Straubenmüller on public school lunches given April 10 in connection with a special exhibit of charts and cartoons prepared by the school children of the city and displayed in Memorial Hall of the Museum.

Mr. Frank E. Watson, of the department of invertebrate zoölogy in the American Museum, has returned from a three-months' expedition to Jamaica, where he made a collection of from twelve to thirteen thousand invertebrates, chiefly insects. Several rare species of hawk moths were obtained—one of the objects of the trip.

Mr. Van Campen Heilner, an associate editor of *Field and Stream*, spent several weeks in March at the American Museum coöperating with the department of ichthyology in the preparation of a table of record weights of fishes.

On March 31 last, Mary Austin exhibited a collection of Indian paintings at a tea given by the publicity department of the American Museum. The pictures were made by school children of the Rio Grande pueblos who had had no instruction in painting, and their value lies solely, as Mrs. Austin said, in the fact that here we have a product of the American soil untouched by any outside influence. Although the color is put on flat and the figures are arranged diagrammatically, there is evidence of genuine artistic ability; the colors are harmonious, there is some success in suggesting motion and rhythm, and there is an idea of perspective. The lack of connecting lines and the delicate clearness of contour in many of them remind one of early Japanese art; some of the silhouettes are decidedly Egyptian in effect.

In the main the paintings depict the religious ideas of the Pueblo Indians. The application of color is symbolical, and the various dances represent the ceremonies for attracting magic powers for protection against the enemy. There is an interesting analogy between the old mystery plays of England and the present Indian drama as shown in these paintings.

The contents of the Field Museum of Natural History in Chicago have been moved to the new museum building in Grant Park.

The auditorium of the new building is the gift of Mr. James Simpson, and will accommodate one thousand people. The Field Museum ended its fiscal year (1919) with a margin of $24,130 over the $156,380 provided by the trustees.

THE Museum of New Mexico is fortunate to have as one of its chief exhibits the building in which its collections are housed. The Palace of the Governors is a monument surviving from the earliest days of the Spanish conquest. Its early history is obscure, but within historical times its walls have served the rulers of a wide territory, for three hundred years, under the flags of four nationalities. The Museum took over this historic residence and maintains there, in connection with a new building, which is constructed in the same general style of architecture, a collection and library relating to the archæology, history, and art of the Southwest. The exhibitions record the pre-Spanish culture of this Pueblo region, including not only artifacts recovered from excavated areas, but also models of pueblos, and illustrative mural paintings. A gallery is also maintained where contemporary artists of the Southwest may display their paintings before dispersing them among the art centers of the country.

NEW MEXICO is making an effort to preserve its original style of architecture, the Spanish idea of building expressed in adobe. The towns of Santa Fe and Taos, both well known centers for artists and tourists, are encouraging the old style because it is more beautiful, enduring, and economical. The new hotel and school at Taos are to be in adobe, like the museum at Santa Fe, and the United States Government will construct its New Mexico buildings of the same material.

THE fiftieth anniversary of the Wisconsin Academy of Sciences, Arts, and Letters was celebrated at a meeting of the Academy, at Madison, on April 23. Dr. Thomas Chrowder Chamberlin, professor emeritus of geology in the University of Chicago and one of the few living founders, addressed the session. Professor Chamberlin was recently the recipient of the Hayden Memorial Medal of the Academy of Natural Sciences of Philadelphia.

PROFESSOR A. S. PEARSE, of the University of Wisconsin, officially represented the American Museum of Natural History as Associate Member of that institution, at the Fiftieth Anniversary of the founding of the Wisconsin Academy of Sciences, Arts, and Letters, at Madison, Wisconsin, on April 23.

THE announcement for the summer of 1920 of the Biological Laboratory at Cold Spring Harbor, Long Island, maintained by the Brooklyn Institute of Arts and Sciences, contains the usual courses given at the Laboratory in zoölogy, botany, and eugenics by a scientific staff under the direction of Dr. Charles B. Davenport.

The Human Skeleton, an Interpretation,[1] by Herbert Eugene Walter, associate professor of biology in Brown University, is written in popular style to give the lay reader insight into the curious mechanism of the human bony framework, its workings, and its origin. By "the interpretative method" Professor Walter arranges the subject of osteology so as to give meaning to the various parts of the human form in the light of comparative anatomy, embryology, and palæontology, and portrays nature's "experiments with skeletons," the evolution of their various features, and their development in the individual.

THE Brooklyn Museum has added to its exhibits a group showing the under-sea life of the cave-worn cliffs in the Bay of La Jolla, California, as a companion to the group previously constructed which portrays the coral reefs of the Bahamas.

THE thieves who broke into the museum of the Ohio State Archæological and Historical Society at Columbus on the night of March 19 were apprehended the following day. They had taken a number of cut gem stones, jewels, rings, revolvers, and edged weapons; practically all of these articles were recovered.

THE new greenhouses recently opened at the New York Botanical Garden include a lecture room of about two thousand square feet. Lectures on botanical subjects may now be given in congenial surroundings and conveniently illustrated by the growing plants.

[1] *The Human Skeleton, an Interpretation.* By Herbert Eugene Walter. Macmillan Co., New York, 1918.

THE educational possibilities of the moving picture are being investigated by a committee appointed by Mr. Ernest L. Crandall, director of lectures and supervisor of visual instruction for the Board of Education of New York City. Dr. G. Clyde Fisher, associate curator of the department of public education in the American Museum, has been chosen to represent the Museum which was one of the first institutions to employ lantern slides and moving pictures in its work with school children. The committee, composed of teachers from some of the public schools and a few producers and distributors of motion pictures, will study the available illustrative material and list the best for the use of teachers. From the work already done it is evident that the producers are interested in the movement and glad to coöperate with the Board of Education to furnish the sort of material needed.

A *Guide to Nature-Study and Garden Opportunities in the Greater City* is to be published by the nature study and garden organizations of New York under the editorship of Mr. Van Eyrie Kilpatrick. The cost will be borne by the School Garden Association.

THE bequest of $100,000 to the general endowment fund of the American Museum of Natural History has been received from the estate of Mr. A. D. Juilliard.

UPON invitation of the American Asiatic Association Mr. Roy Chapman Andrews delivered two lectures at Carnegie Hall upon the American Museum's Asiatic expeditions. The first was a discussion of the expedition to Mongolia, which had just returned. At the second lecture there was an exhibit of the natural color photographs taken by Mrs. Yvette Borup Andrews during 1916–17 in Yunnan and Burma. The Asiatic Association is planning other lectures to be given in various cities of the United States, in accordance with the proposed coöperation between this organization and the American Museum of Natural History.

THE department of anthropology of the American Museum of Natural History has received a gift of four thousand specimens of prehistoric Egyptian flint implements and hammerstones from Mr. August Heckscher. They consist of hand axes, saws, arrow points, spear points, and knives dating back to the Old and New Stone ages.

NEITHER the formation and behavior of volcanoes nor the evolution of the continents of the earth is a phenomenon which one would at first thought consider a subject for a moving picture. The Educational Films Corporation, however, has reduced these geological events to the dimensions of an American Museum laboratory, where the world could be rotated with a dynamo, and the volcano fumes represented with hydrochloric acid and ammonia gas.

The volcano pictures are designed to elucidate photographs of actual volcanoes. Many, if not most, of the earth's volcanoes are found along faults or cracks in the earth's surface. The subterranean inflow of volcanic material causes the uplift of a given area, and where this cracks away from the adjoining portions of the crust a vent may be provided for the uprush of lava, resulting in either a broad lava flow or a volcano of the explosive type. To illustrate this phenomenon a series of strata was arranged behind glass with sand and felt which faulted and folded most satisfactorily when lateral pressure was applied. Meanwhile the intrusion of the lava was indicated in black paint on the glass after the manner of the cartoons commonly drawn upon the moving picture screen.

The arrangement of a model volcanic eruption presented a somewhat more complicated project. From a small black plaster volcano a cloud of steam and gas arose and mushroomed out in true canopy form, while copious lava streams of phosphorus ran down the volcano's sides and illuminated them as at night. In an explosion of flash paper the top of the crater disappeared by the drop of an electrically released bucket of sand and left the rugged remnants of the mountain's cone. A detail view showed a little red-tiled house receiving the full force of the rain of pumice, dust, and volcanic débris, and finally succumbing to the onrushing "lava" torrent.

After this success in manipulating a volcano the reconstructors of earth sculpture turned to the formation of the world as a whole and the origin of continents. The earth is not, as is most generally thought, a

spheroid or flattened sphere, but tends in a slight degree, as its crust shrinks, to take the form of a tetrahedron. If a body of water covering five-sevenths of the surface were held on such a figure by gravity and the whole rapidly rotated, it would take the form of an "earth-shaped" body with approximately the same distribution of land and water as at present; that is, three continental bodies broad at the north and pointed toward the south (the Americas, Eur-Africa, Asia plus Australia) and in addition the Antarctic continent at the bottom point or coign. The earth's rotation tends to bring it to a spheroidal form, as the sphere is the body with the smallest surface in proportion to its volume, whereas the shrinkage of the crust tends to bring the earth to the tetrahedral form or the figure having the greatest surface for its volume. This latter is the form which a balloon takes in collapsing. To illustrate these operations in the formations of the continents the moving picture artists constructed a globe of such a form that when a rubber coating was stretched over it, the high points of the land as it stood in Cambrian times (the earliest geological age for which a map of the land has been drawn) showed through as prominences. Rotating the globe they exhausted the air under this rubber film, causing the latter slowly to collapse and reveal the outlines of the present continents.

This series of geological moving pictures constitutes the beginning of a wide project in visual education undertaken by the Educational Films Corporation which aims to produce complete courses for school use, at the same time embodying material which can be released on the general circuit.

A BILL creating a State Roosevelt Memorial Commission has passed both branches of the legislature at Albany, and is now before the Governor. Plans for the erection of the east pavilion and the African hall of the American Museum as a state memorial to Theodore Roosevelt will be presented to this Commission.

SINCE the December issue of NATURAL HISTORY the following persons have been elected members of the Museum:

Associate Benefactor, MR. HENRY P. DAVISON.

Patrons, MESSRS. B. PRESTON CLARK, JOHN A. ROEBLING and GERRISH H. MILLIKEN.

Fellow, MISS E. M. KITTREDGE.

Life Members, MESDAMES PHILIP C. GARRET, GEORGE B. GORDON, MARY J. KEARFOTT, PAUL MCEWEN, ROSA VETTEL, MISSES MARY APPLETON, ANNA EDGAR DONALD, DOCTORS HARRISON GRAY OTIS, RODRIGUES OTTOLENGUI, EDWARD H. ROGERS, MESSRS. EDWARD F. ALBEE, HARRY ALEXANDER, L. M. BOOMER, MIDDLETON S. BURRILL, W. DIXON ELLIS, CORNELL EMERY, MURRAY W. FERRIS, WM. E. HARMON, BENJAMIN V. HARRISON, JAMES J. HIGGINSON, JOHN HUGHES, LEON ISRAEL, FRANK B. KEECH, GEORGE LANGFORD, LOUIS L. MOWBRAY, C. A. PALM, WILLIAM ROSENBAUM, GEORGE T. SLADE, ALBERT ERNEST SMITH, THEODORE TIEDEMAN, S. BRECK P. TROWBRIDGE, A. C. VEATCH, LOUIS B. WADE, THOMAS J. WATSON, HENRY D. WHITON, HENRY ROGERS WINTHROP, FARNHAM YARDLEY and MASTER JAMES M. ANDREWS, 4TH.

Sustaining Members, MESDAMES CLARENCE W. BOWEN, COLEMAN DU PONT, THOMAS HUNT, THALIA MILLETT, JOHN T. PRATT, MESSRS. C. ADSIT, STEPHEN PHILBIN ANDERTON, ISAAC BRANDON, HARRY C. BURNHAM, O. E. CHANEY, CLEMENT L. DESPARD, EDWARD H. FLOYD-JONES, GEORGE I. FOX, FRANCIS RANDOLPH MAYER and FREDERICK W. SENFF.

Annual Members, MESDAMES MOSES ASCHER, ANSON P. ATTERBURY, ALEXANDER L. BARBOUR, CHARLES F. BOUND, M. LE BRUN COOPER, CHARLES HULBERT DENISON, OSCAR DRESSLER, W. H. EBBITT, WILLIAM HENRY ELY, E. C. HENDERSON, EDWARD A. MORRISON, JOSEPH G. MYERSON, BENJAMIN NICOLL, FANCHER NICOLL, W. B. RICHARDS, ISAAC RITTENBERG, FANNY SCOTT RUMELY, GUSTAV SCHWAB, F. S. SMITHERS, WM. FREDERICK STAFFORD, JAMES TALCOTT, JOHN N. TONNELÉ, EDNA K. TUNIS, HENRY C. VALENTINE, MISSES GENEVIEVE C. BABBITT, BERTHA M. BENTLEY, ANNA M. CLARK, M. E. CLEVELAND, NORMA DANIELS, JULIA T. EMERSON, IRMA GOUDCHAUX, EDITH HAAS, MAUDE HITCHCOCK, THE REV. JOSEPH REITH,

Sister M. Charita, Doctors Murray H. Bass, Jesse G. M. Bullowa, Armistead C. Crump, Henry W. Frauenthal, F. Elmer Johnson, J. Henry Lancashire, Ellice McDonald, Julian J. Meyer, F. J. Swanson, Frederic O. Virgin, George A. Wyeth, Messrs. David Aaron, Michael M. Abrahams, Chellis A. Austin, Isaac D. Bachmann, P. Bagot, Arthur C. Bainbridge, C. P. Barnett, Eugene T. Barry, F. H. Bennett, J. A. Bensel, Samuel H. Bijur, Thomas H. Blodgett, Russell E. Briggs, Ernst Brisch, Edward B. Brooks, Walston H. Brown, H. Durant Cheever, Harold Benjamin Clark, Francis J. Clowes, C. Philip Coleman, Arthur N. Cooley, Robert M. Coyle, Gaylord C. Cummin, D. M. Darby, Thomas M. Debevoise, I. de Bruÿn, William C. De Lanoy, Julian F. Detmer, F. A. Dillingham, Herbert Lowell Dillon, S. F. Dribben, Henry T. Dumbell, Franklin P. Duryea, John Gerow Dutcher, C. R. Ebert, Wm. Einstein, William J. Eisner, Lawrence Bogert Elliman, George H. Engelhard, Sidney C. Erlanger, Louis A. Fahs, Francis Fergusson, E. C. Fink, Edwin A. Fisher, Walter G. Fisher, John L. Fitzhugh, William Medlicott Fleitmann, V. Forbin, Walter H. Foster, Frederick P. Fox, Chas. A. Fulle, Herbert F. L. Funke, W. G. Gallowhur, Herman O. Ganss, Lewis B. Gawtry, Charles Geigerman, Frederick Geller, Samuel H. Gillespie, Herbert P. Gleason, Wm. Goldman, Nathan Goldmann, Max Goldsmith, William C. Gruner, M. Gugenheim, Andrew P. Gunari, Harrison H. Hallett, Albert H. Harris, Philip Harrison, Edward C. Hartshorne, Edward Hatch, Jr., W. Gerald Hawes, David S. Hays, Newbold L. Herrick, A. Holzman, Walter E. Hope, Harry Horvitz, Geo. S. Hoyt, Wm. A. Hutcheson, Henry A. James, Henri Jeltrup, Gilbert H. Johnson, William R. Jones, William D. Judson, Max B. Kaesche, Henry A. Kayser, Charles S. Keene, W. B. Kibbee, Jerome A. King, G. A. Knoche, Basil G. Kodjbanoff, Albert M. Kohn, Charles C. Kurzman, Eugene La Bar, Aaron Langstadter, Henry R. Lathrop, John D. Lawson, Jacob Leberman, Samuel Lee, Philip J. Levi, Samuel Liebman, Milton L. Lissberger, W. Kingsland Macy, L. Wm. Malone, William A. Marble, B. K. Marcus, Selon May, F. J. McLain, W. A. McLaren, John Lenord Merrill, Harry H. Meyer, J. A. Migel, Hugh K. Milliken, Levis W. Minford, Lewis Spencer Morris, Perley Morse, Fred A. Muschenheim, Silas Musliner, Jason A. Neilson, Harry C. Oppenheimer, Homer S. Pace, Leo Pasvolsky, Charles A. Peacock, T. W. S. Phillips, Edward Prizer, Vilhelm Reimann, Daniel Rheinauer, Arthur Rice, Joseph A. Richards, Louis J. Robertson, G. Vernor Rogers, Henry W. Rogers, Frederick K. Rupprecht, Walter Russell, John E. Sanders, William Schrader, Otto Seidenberg, Henry F. Sewall, Henry T. Seymour, S. W. Shipway, Ernest Shoemaker, Otto B. Shulhof, Abraham Silberstein, Russell R. Sloan, J. B. Smull, Frederic Soldwedel, Louis H. Soule, Keith Spalding, Charles L. Starbuck, John Staudt, Jacob Stein, Edward H. Stickels, Nathan Straus, Jr., Duncan Struthers, Robert Stuart, Gerard Swope, Walbridge S. Taft, Gage E. Tarbell, N. W. Taussig, Charles Thaddeus Terry, E. Thiele, Norton B. Tillotson, H. N. Townsend, Nesib Trabulsi, Henry A. Truslow, Geo. H. Warner, Wm. Ives Washburn, Jesse A. Wassermann, F. E. Watermeyer, Hugo Weigert, Edmond Weil, Leon Weil, William J. Weir, James R. Williston, Morgan Wing, Norman L. Zeno, William H. Zinsser and Alfred Wilkinson, in Memoriam.

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